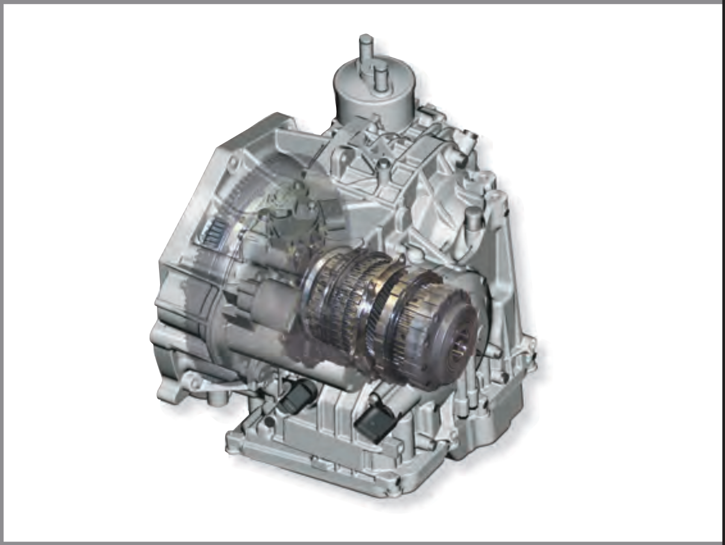
6-Speed Automatic Transmission 09G/09M

Design and Function



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Course Number 851503

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Course Number 851503

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New!

Important/Note!

The Self-Study Program provides you with information regarding designs and functions.

The Self-Study Program is not a Repair Manual!

For maintenance and repair work, always refer to the current technical literature.

6-Speed Automatic Transmission 09G/09M

The Japanese automatic transmission manufacturer AISIN Co., LTD is the developer and manufacturer of the 09G transmission. Volkswagen engineers developed the transmission in conjunction with Aisin and adapted it to Volkswagen vehicles.

The 09G/09M 6-speed automatic transmission is installed in the following Volkswagen vehicles:

Designation	Maximum Torque Transfer	Vehicles
09G	184 lbs-ft (250 Nm)	2005 Jetta/New Beetle
09G	184 lbs-ft (250 Nm)	2006 Passat
09M	332 lbs-ft (450 Nm)	2006 Passat

The transmission is adapted for use with different engines and vehicles by varying:

- The number of disc pairs for clutches and brakes
- The adaptation of the ATF pressure on the clutches and brakes
- The configuration of gear pairs, planetary gear sets (e. g. four instead of three planetary gears), shafts and bearings
- The reinforcement of housing components
- The ratio of the final drive and the intermediate drive
- The size of the torque converter
- The torque converter characteristic curve of the torque boost (conversion factor or conversion boost)
- The selector lever
- The ignition key removal lock

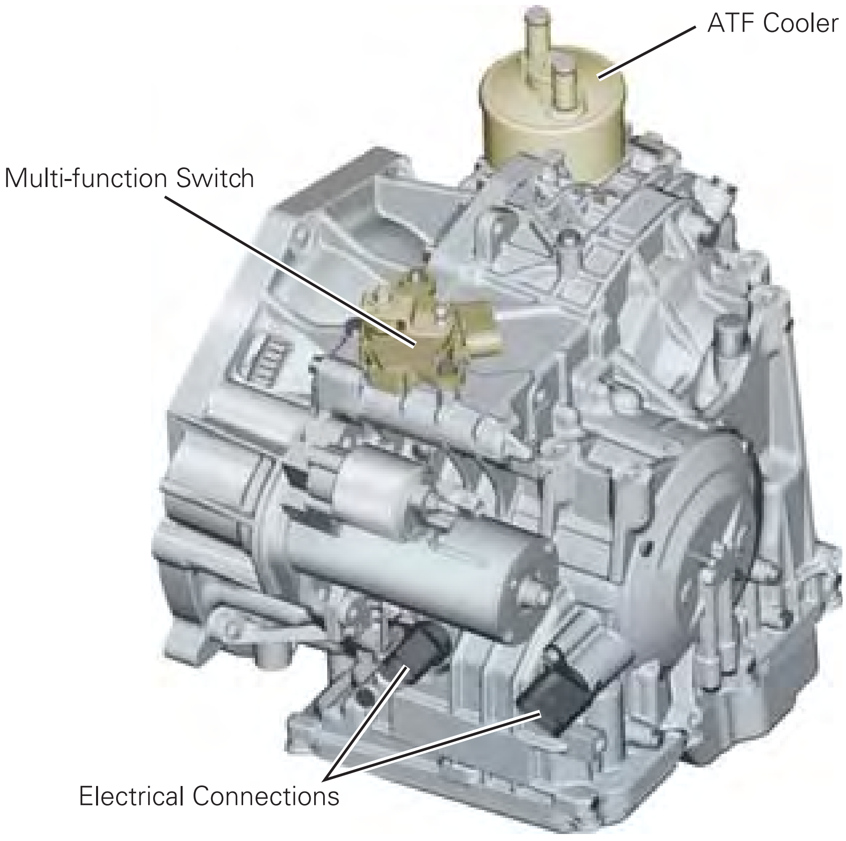
Introduction

The transmission sets new standards for dynamics and efficiency in the diagonally installed, conventional stepped automatic transmission segment through:

- Low weight
- High overall transmission ratio spread
- Compact dimensions of the transmission
- High speed of shifting
- High level of shifting comfort

The same manufacturer makes the 6-speed automatic transmission in the Volkswagen Touareg designated 09D. Both automatic transmissions from AISIN use a Lepelletier arrangement.

The advantage of this Lepelletier arrangement is its simple, space-saving and lightweight design. It combines a simple planetary gear set with a subsequent Ravigneaux arrangement. This makes six speeds possible with only five shifting elements.



Technical Data

Manufacturer	AISIN Co., LTD. Japan
Transmission type	Electro-hydraulically controlled 6-speed planetary gear (stepped automatic transmission) with hydrodynamic torque converter and traction controlled torque converter lock-up clutch for front wheel drive and transverse installation
Control	Hydraulic control module in oil sump with external electronic control module Dynamic Shifting Program DSP with separate Sport program in “Position S“ and the Tiptronic shifting program for manual gear change (optional with Tiptronic steering wheel)
Torque performance	Up to 332 lbs-ft (450 Nm), depending on version
Intermediate drive for code letters GSY/GJZ	No. of teeth 52/49 = 1.061
Final drive GSY	No. of teeth 61/15 = 4.067
Final drive GJZ	No. of teeth 58/15 = 3.867
ATF specification	G 052 025 A2
Filling amount	7.4 quarts (7.0 liters) [initial fill] lifetime filling
Weight	Approx. 182 lbs (82.5 kg)
Length	Approx. 13.8 in (350 mm)
Spread	6.05

Depending on engine type, overall ratio is configured as 5+E transmission or as 6-speed transmission.

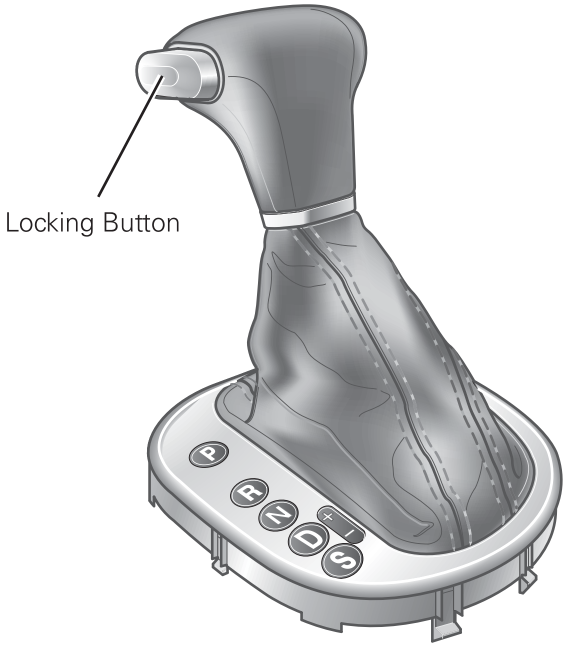
For the 5+E transmission, the highest speed is reached in 5th gear. The 6th gear reduces engine speed, improves driving comfort and reduces fuel consumption:

For the 6-speed transmission configuration, the highest speed is reached in 6th gear. The 6th gear lowers transmission gear ratio and increases driving dynamics.

Selector Lever

The appearance of the selector lever may differ for different vehicles. The operation and the function is the same, however, for all vehicles with this automatic transmission.

Steering wheel paddles are available as options and can also differ in appearance for individual vehicles.



Steering Wheel Paddles

Selector Lever Positions and Operation

P - Park

Before the selector lever can be moved out of this position, the ignition must be switched on and the foot brake must be pressed.

Additionally, the locking button on the selector lever must be pressed.

R - Reverse

To shift into this gear, the locking button must be pressed.

N - Neutral

The transmission is in idle in this position.

If the selector lever is in this position for a long time and the vehicle is driven at less than 3 mph (5 km/h), the foot brake must be pressed again to leave this position.

D - Drive

In this driving position, the forward gears are shifted automatically.

S - Sport

The locking button must be pressed to shift into the selection range “S”. The control module selects gears automatically according to a “sporty” characteristic curve.

+ and **-**

The Tiptronic functions are performed in the right selector lever gate and at the steering wheel paddles.

Selector Lever Design in 2005 Jetta

The selector lever activates the Multi-Function Transmission Range (TR) Switch F125 via the selector lever linkage. Mechanical movement of the linkage is converted by the Multi-Function Transmission Range (TR) Switch F125 into electrical signals corresponding to the selector lever position. The electrical signals are sent over analog wires to the Transmission Control Module (TCM) J217.

Selector Lever Park Position Lock Switch F319

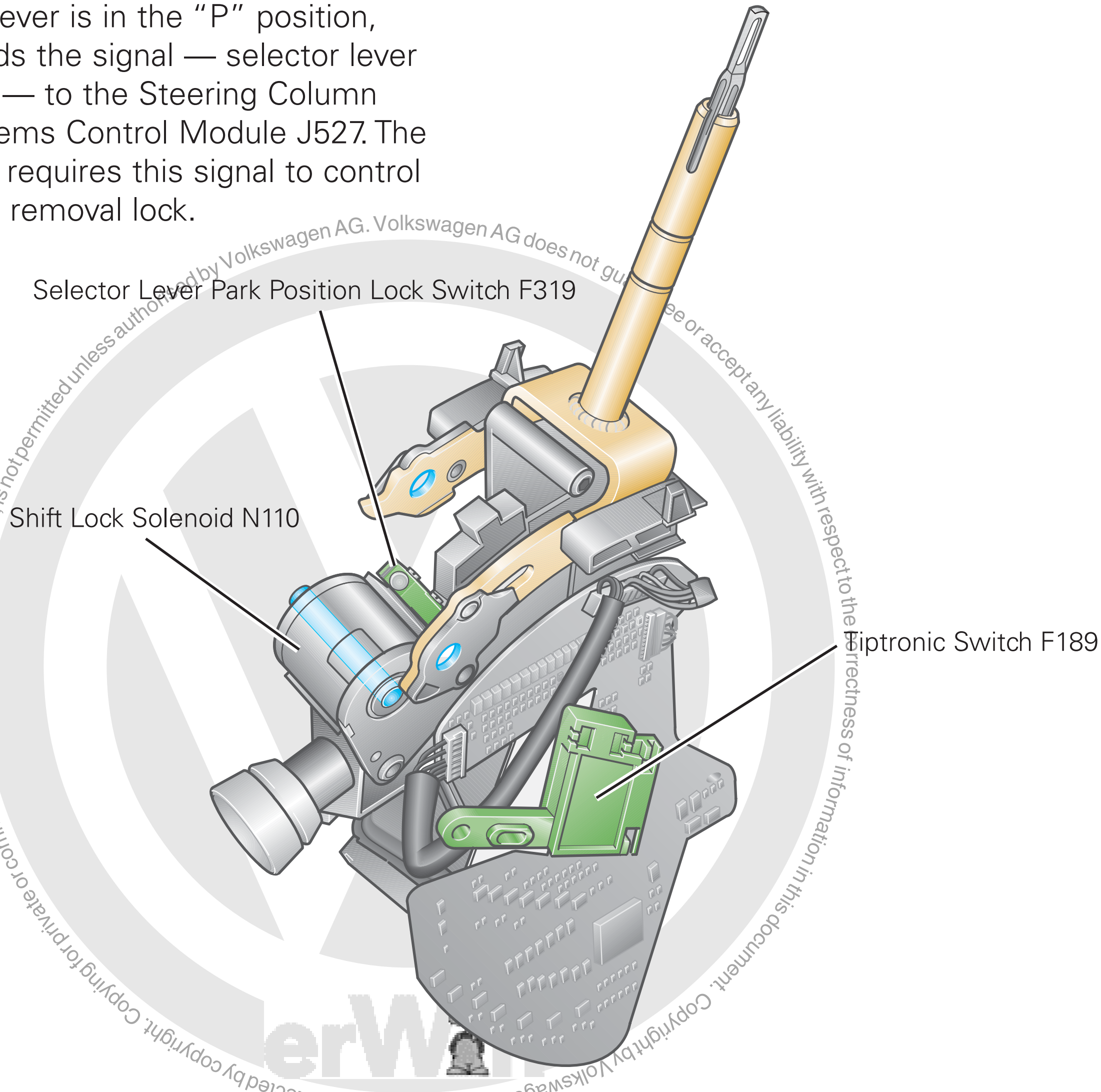
If the selector lever is in the "P" position, the switch sends the signal — selector lever in position "P" — to the Steering Column Electronic Systems Control Module J527. The control module requires this signal to control the ignition key removal lock.

Shift Lock Solenoid N110

The Shift Lock Solenoid N110 is controlled by the Transmission Control Module (TCM) J217.

Tiptronic Switch F189

The switch recognizes the Tiptronic gate as well as Tip + and Tip -. The signal travels over an analog wire to the Transmission Control Module (TCM) J217.



Ignition Key Removal Lock in 2005 Jetta

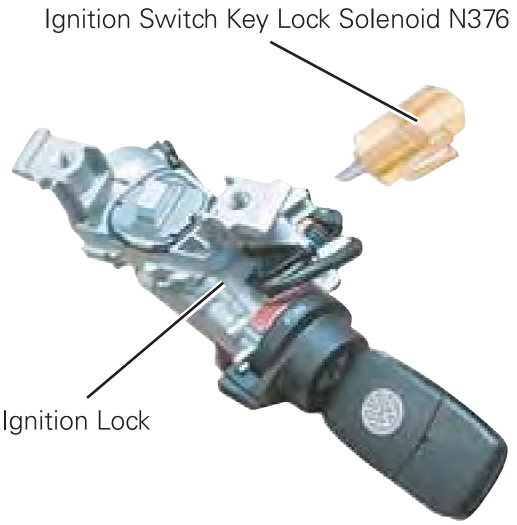
The ignition key removal lock prevents the ignition key from being turned back into the removal position when the park lock is not engaged.

It functions electromechanically and is controlled by the Steering Column Electronic Systems Control Module J527.

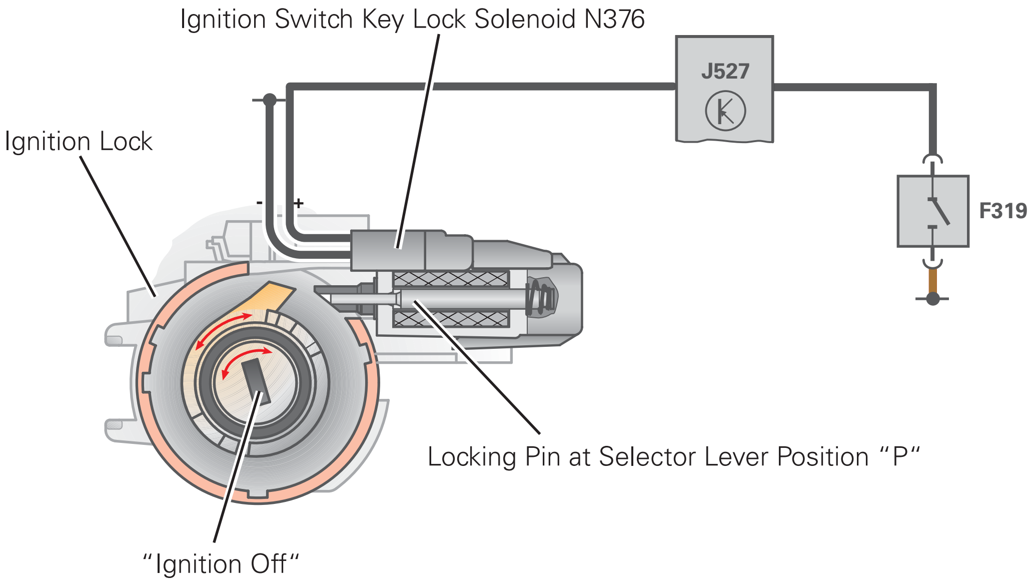
Steering Column Electronic Systems Control Module J527 recognizes the position of the Selector Lever Park Position Lock Switch F319.

If the switch opened, the selector lever is in the “P” position; the Ignition Switch Key Lock Solenoid N376 is not supplied with current.

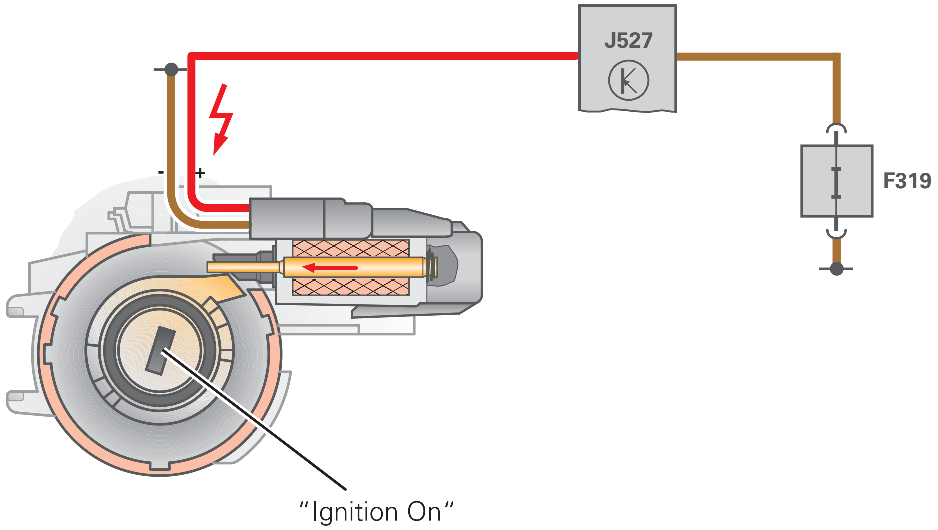
The ignition key can be removed.



Selector lever in Park Position, Ignition is Switched Off


Ignition Switch Key Lock Solenoid N376
J527
Ignition Lock
F319
-
+
Locking Pin at Selector Lever Position “P“
“Ignition Off“

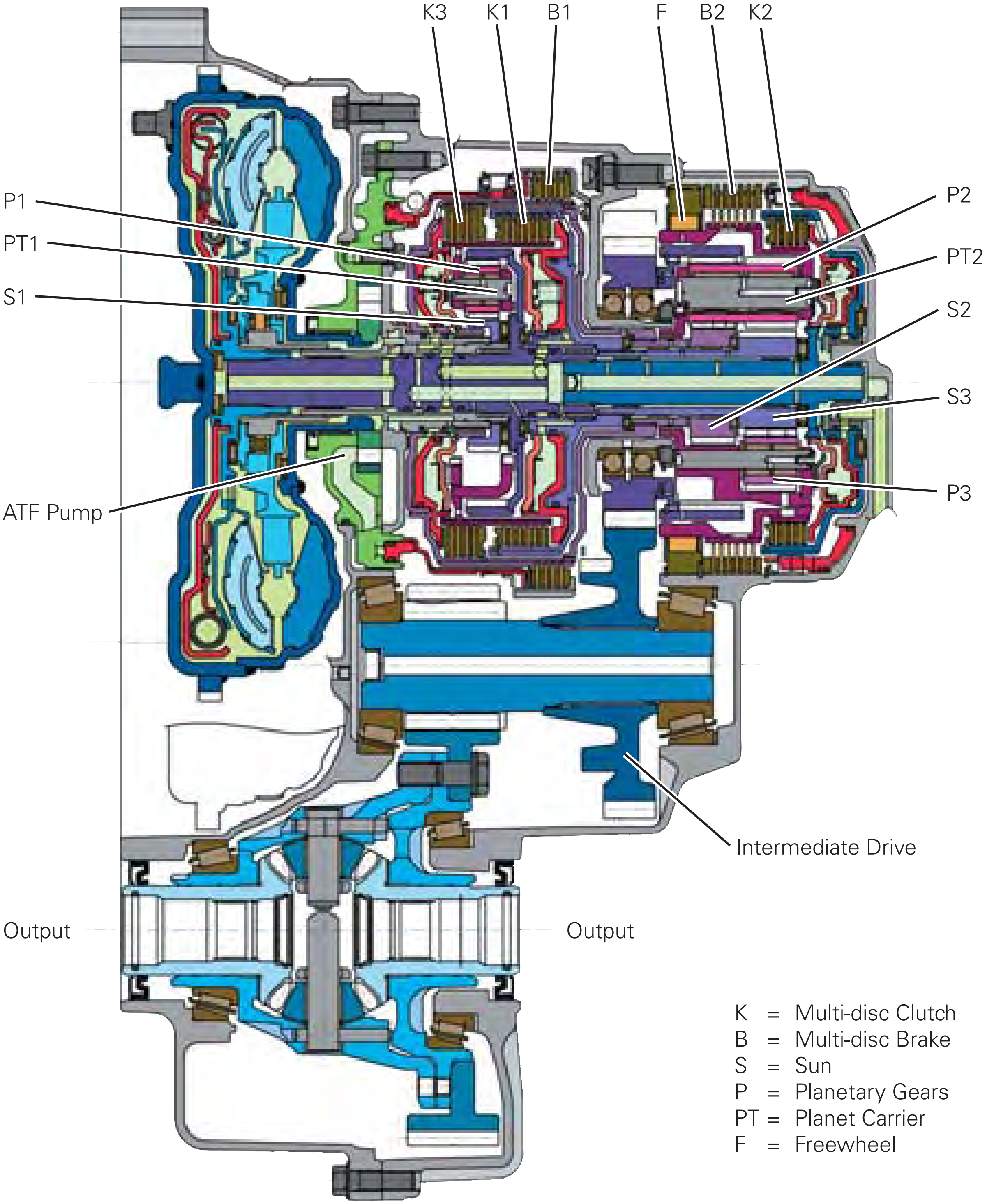
Selector Lever in Drive Position, Ignition is Switched On


J527
F319
-
+
“Ignition On“

Transmission Design

Transmission Section 09G

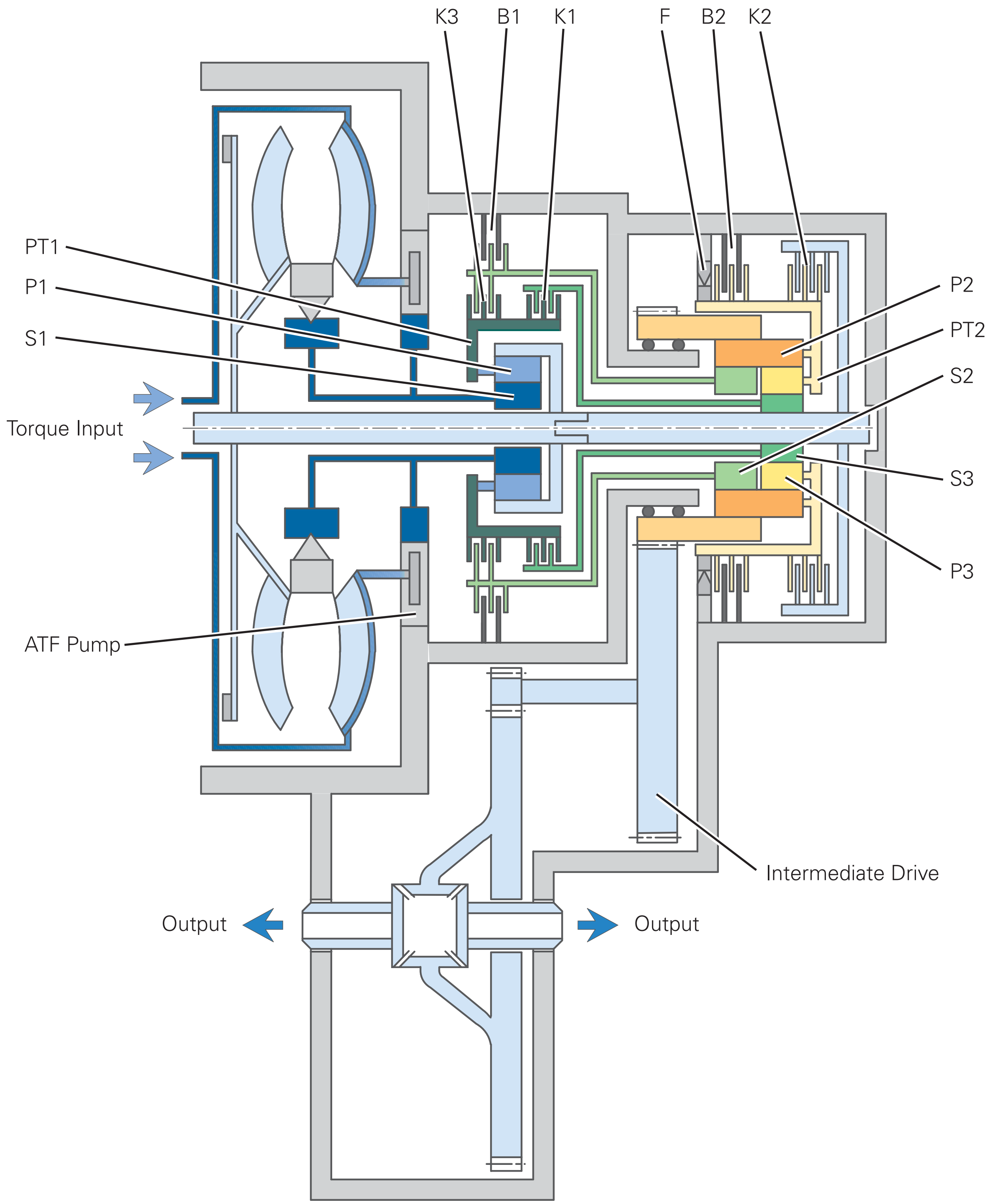
The transmission section describes the original design and configuration of the components in the transmission.


K3
K1
B1
F
B2
K2
P1
PT1
S1
ATF Pump
P2
PT2
S2
S3
P3
Intermediate Drive
Output
Output

K = Multi-disc Clutch
B = Multi-disc Brake
S = Sun
P = Planetary Gears
PT = Planet Carrier
F = Freewheel

Transmission Section 09G - Schematic

This illustration provides clarification.


K3
B1
K1
F
B2
K2
PT1
P1
S1
P2
PT2
S2
Torque Input
S3
P3
ATF Pump
Intermediate Drive
Output
Output

Planetary Gear/Shifting Elements

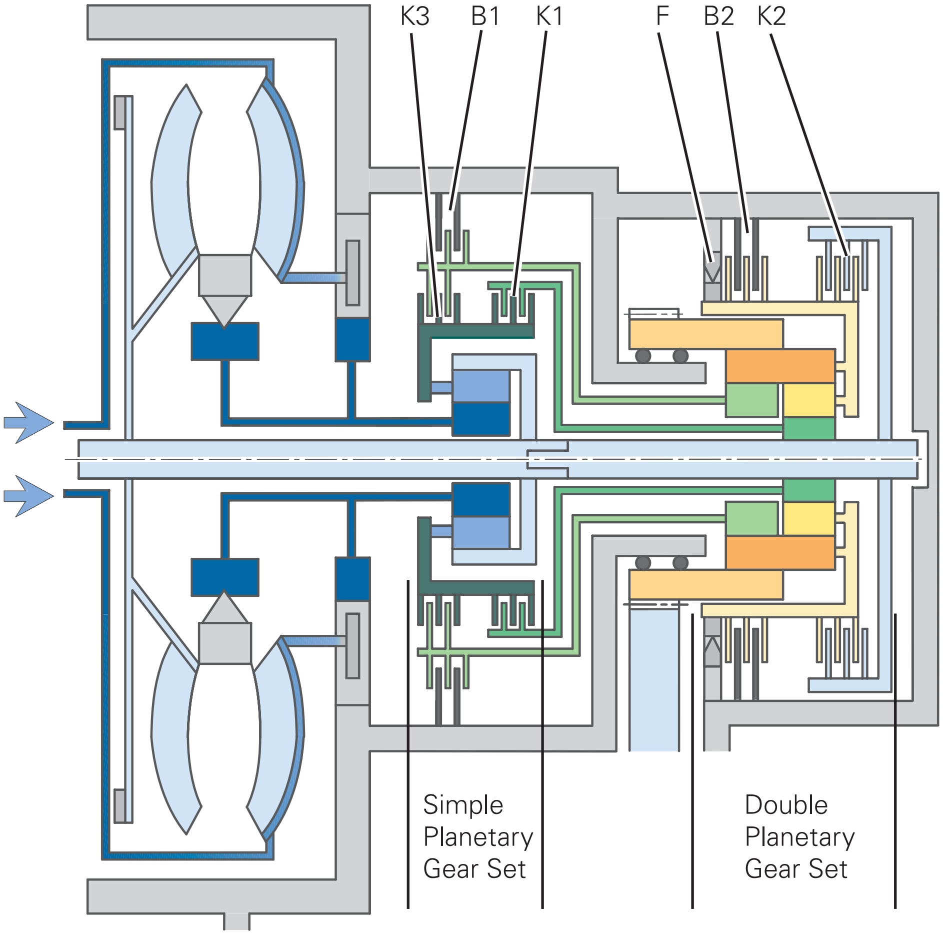
The planetary gear set is a Lepelletier design. The engine torque first drives a simple planetary gear set. From the simple planetary gear set, it is transferred to a Ravigneaux double planetary gear set.

Multi-disc clutches K1 and K3 and multi-disc brake B1 are located on the simple planetary gear set. The number of planetary gears depends on the transmission's torque transfer.

Multi-disc clutch K2 and multi-disc brake B2, as well as freewheel F, are located on the double planetary gear set.

The clutches achieve a control behavior that is independent of engine speed through their dynamic pressure equalization. The clutches K1, K2 and K3 pass the engine torque into the planetary gear. The brakes B1 and B2 and the freewheel support the engine torque at the transmission housing. All clutches and brakes are indirectly controlled by the electrical pressure control valves.

Freewheel F is a mechanical shifting element. It is arranged in parallel with brake B2.



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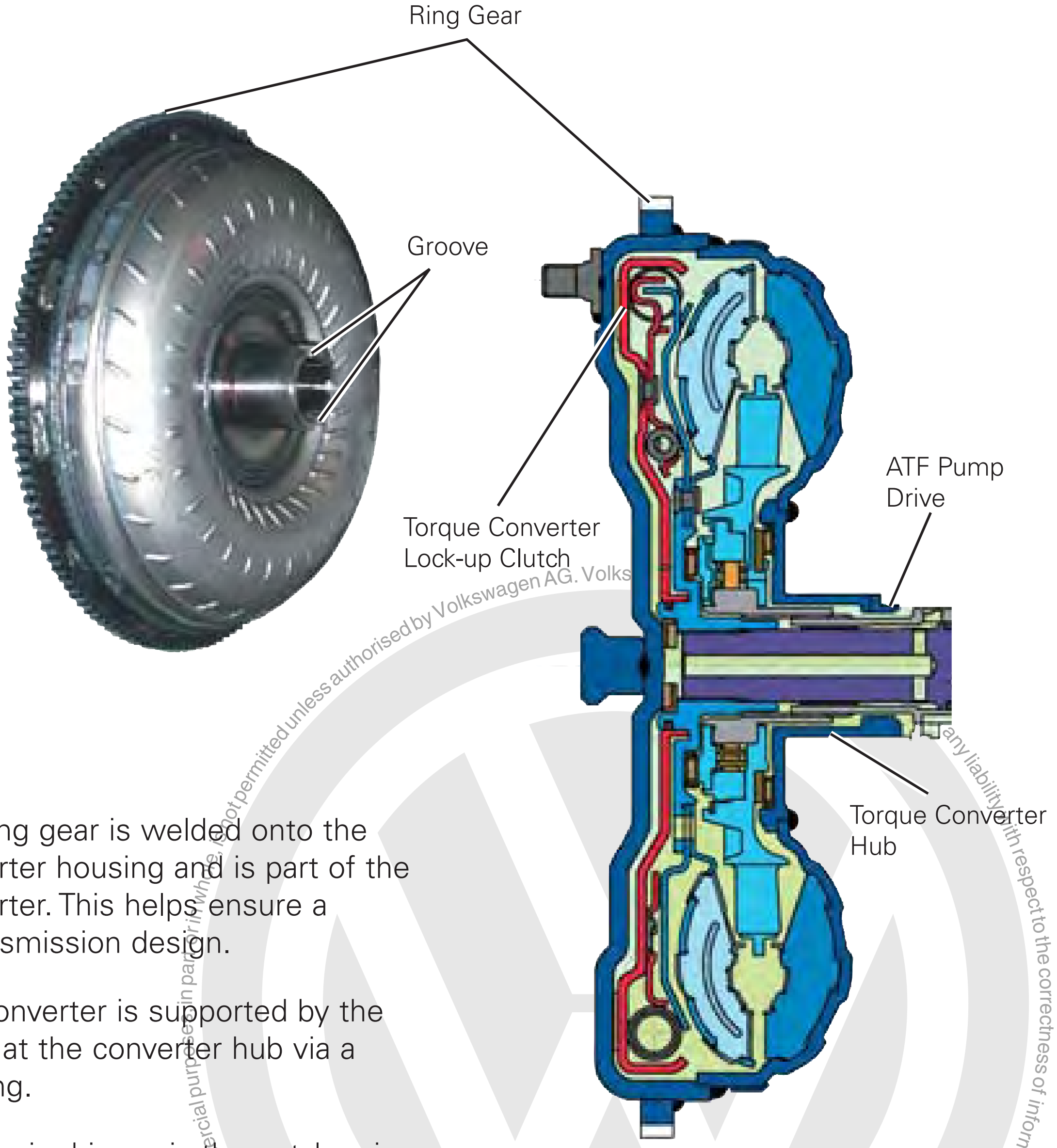
Torque Converter

The hydro-mechanical torque converter serves as a starting element and increases torque in the conversion range. There is a torque converter lock-up clutch integrated into the torque converter.


Ring Gear
Groove
Torque Converter Lock-up Clutch
ATF Pump Drive
Torque Converter Hub

The starter ring gear is welded onto the torque converter housing and is part of the torque converter. This helps ensure a compact transmission design.

The torque converter is supported by the transmission at the converter hub via a friction bearing.

The ATF pump is driven via the notches in the torque converter hub.

This torque converter can be used in different engine applications by adapting the internal components.

Torque Converter Lock-Up Clutch

Design

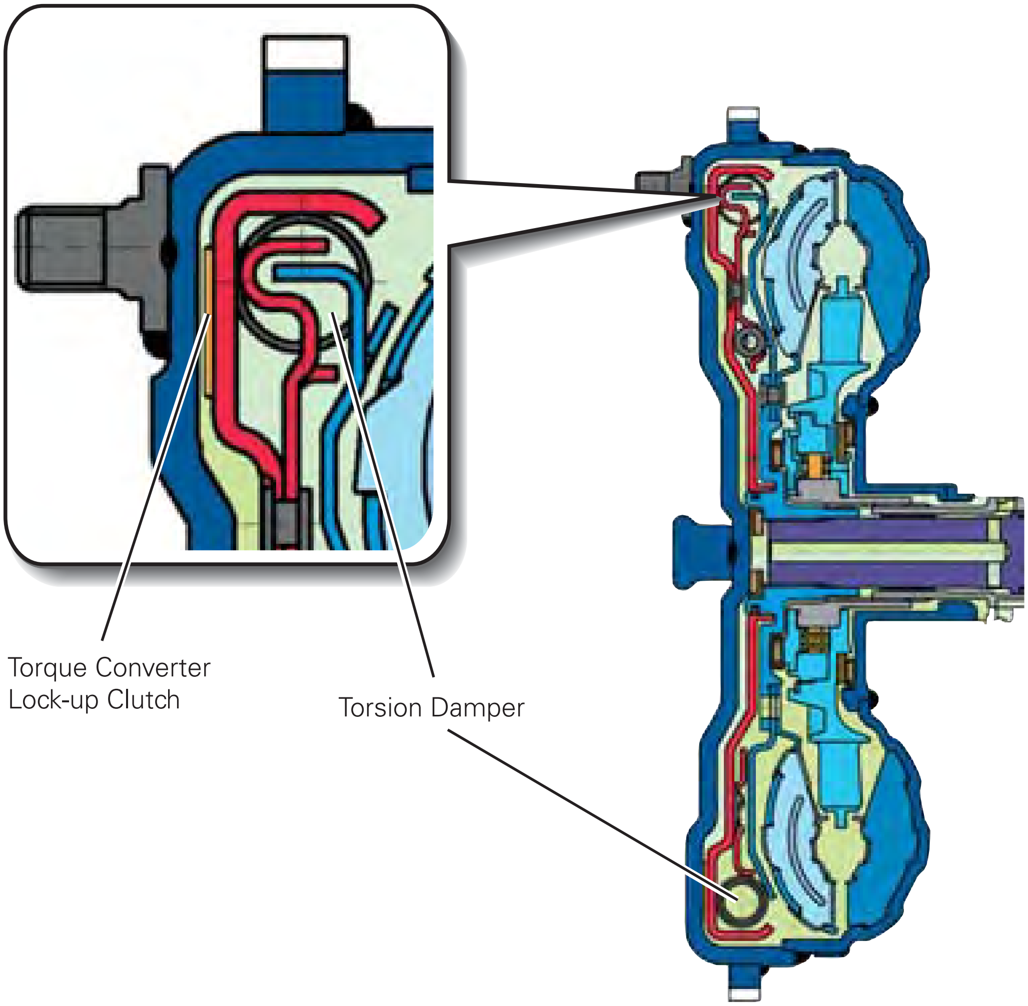
The torque converter is equipped with a torque converter lock-up clutch with integrated torsion dampers.

The torsion dampers reduce torsion vibrations when the torque converter lock-up clutch is closed. This greatly expands the range in which the torque converter lock-up clutch can be closed.

There are three basic states:

- Torque converter lock-up clutch open
- Torque converter lock-up clutch regulated operation
- Torque converter lock-up clutch closed

During normal driving operation, the torque converter lock-up clutch can be closed in each gear.



Operating Ranges of the Torque Converter Lock-Up Clutch

Depending on driving mode, engine load, and vehicle speed the torque converter lock-up clutch is first regulated with minimal slip and subsequently completely closed.

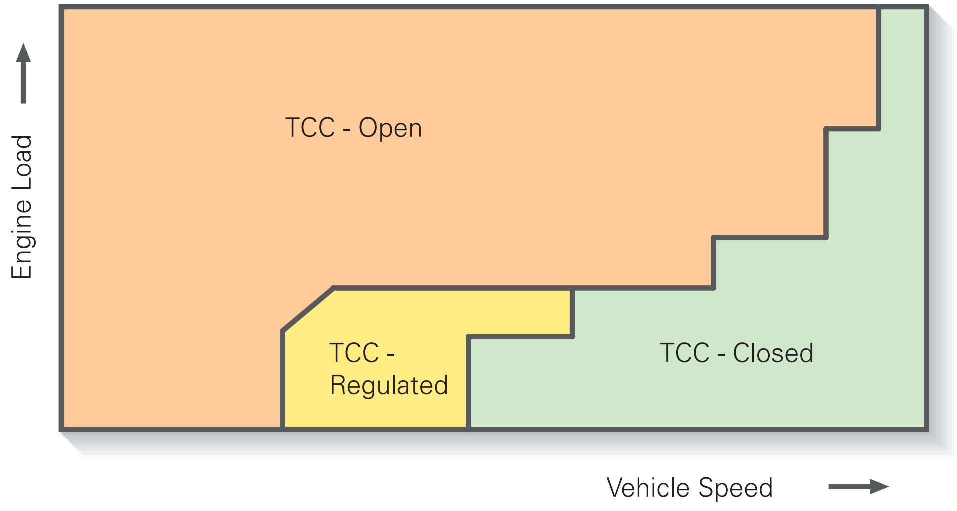
During regulated operation, fuel consumption is reduced compared to an open torque converter lock-up clutch (TCC) and drive comfort is improved compared to a closed torque converter lock-up clutch.

Using Tiptronic in "S" mode, the torque converter lock-up clutch is closed as soon as possible. The direct power connection between engine and transmission improves the sporty driving feel.

In a climbing mode, the torque converter lock-up clutch closes in 2nd gear.

When ATF temperature is above 130 °C, the torque converter lock-up clutch is no longer regulated, but instead is closed quickly.

This helps the ATF maintain a lower thermal load and cools it down.



ATF Supply/Lubrication

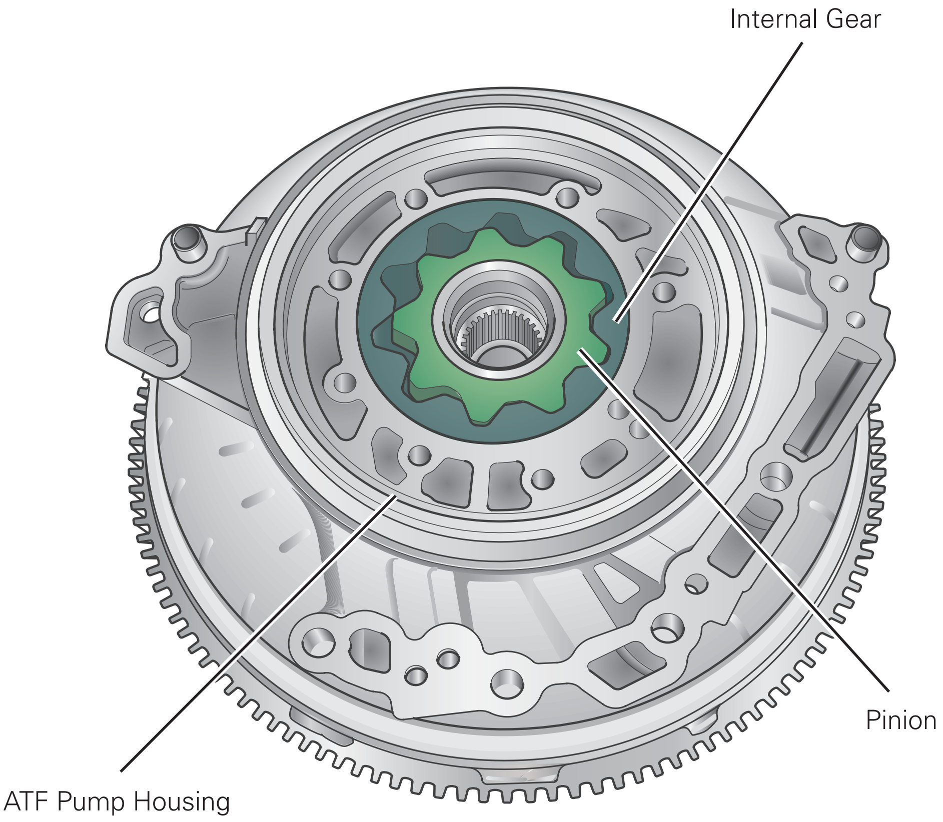
ATF (Automatic Transmission Fluid)

The high standards regarding shifting quality, reliability, and ease of maintenance place the highest demand on the ATF.

The ATF influences the friction coefficient of the clutches and the brakes.

The ATF is developed along with the design and testing of the transmission. It is necessary that only ATF with the correct designation be used for this transmission. The correct ATF is necessary for efficient transmission function.

The planetary gear, final drive, and differential have a common ATF supply.



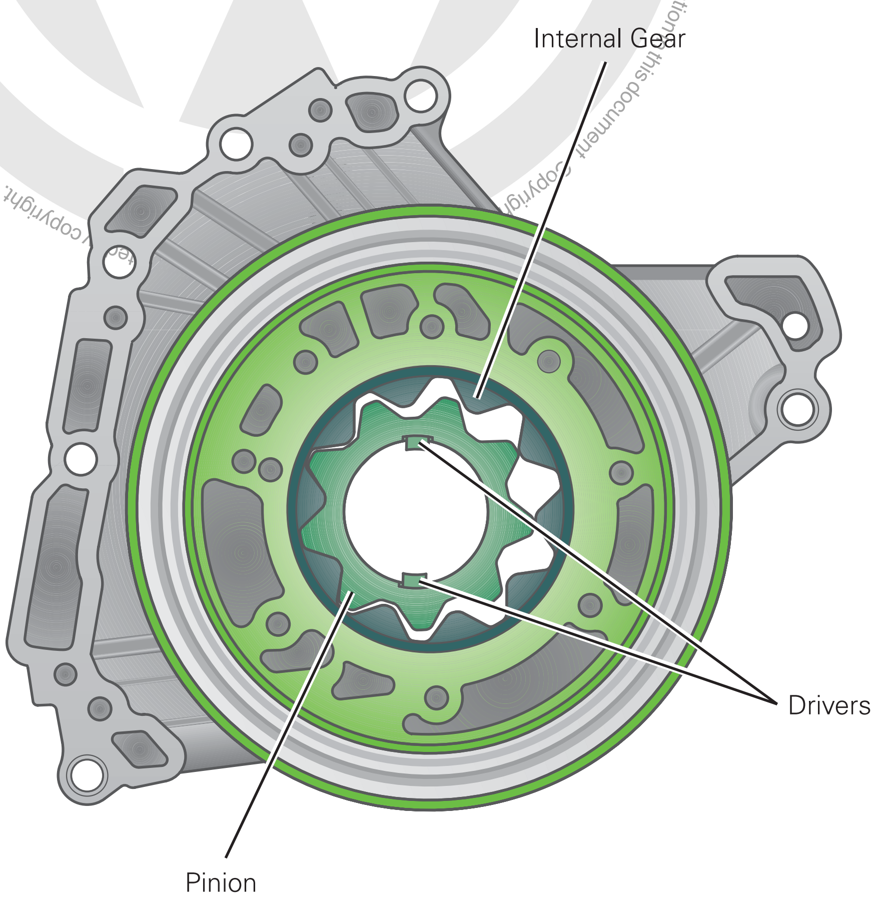
ATF Pump

One of the most important components of an automatic transmission is the ATF pump. Without a sufficient ATF supply, the transmission cannot work efficiently.

The ATF pump is an internal tooth gear pump (duo-centric pump).

The pump is characterized by low friction and light weight.

It is driven directly by the engine (engine RPM) via the torque converter housing and the converter hub. The pinion drivers engage with two torque converter hub notches. The converter hub is supported by the pump housing via a friction or needle bearing.



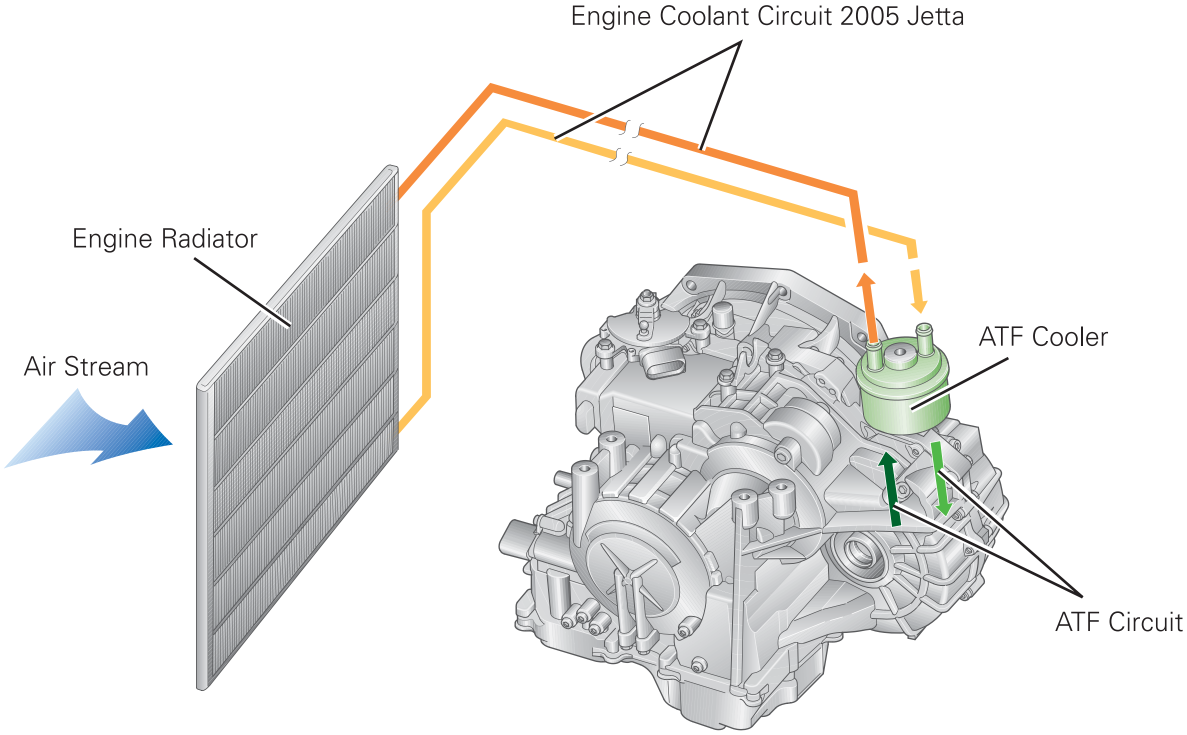
When mounting the torque converter and before installing the transmission, it is important to make sure that the ATF pump drivers engage correctly in the converter hub grooves.

ATF Cooling

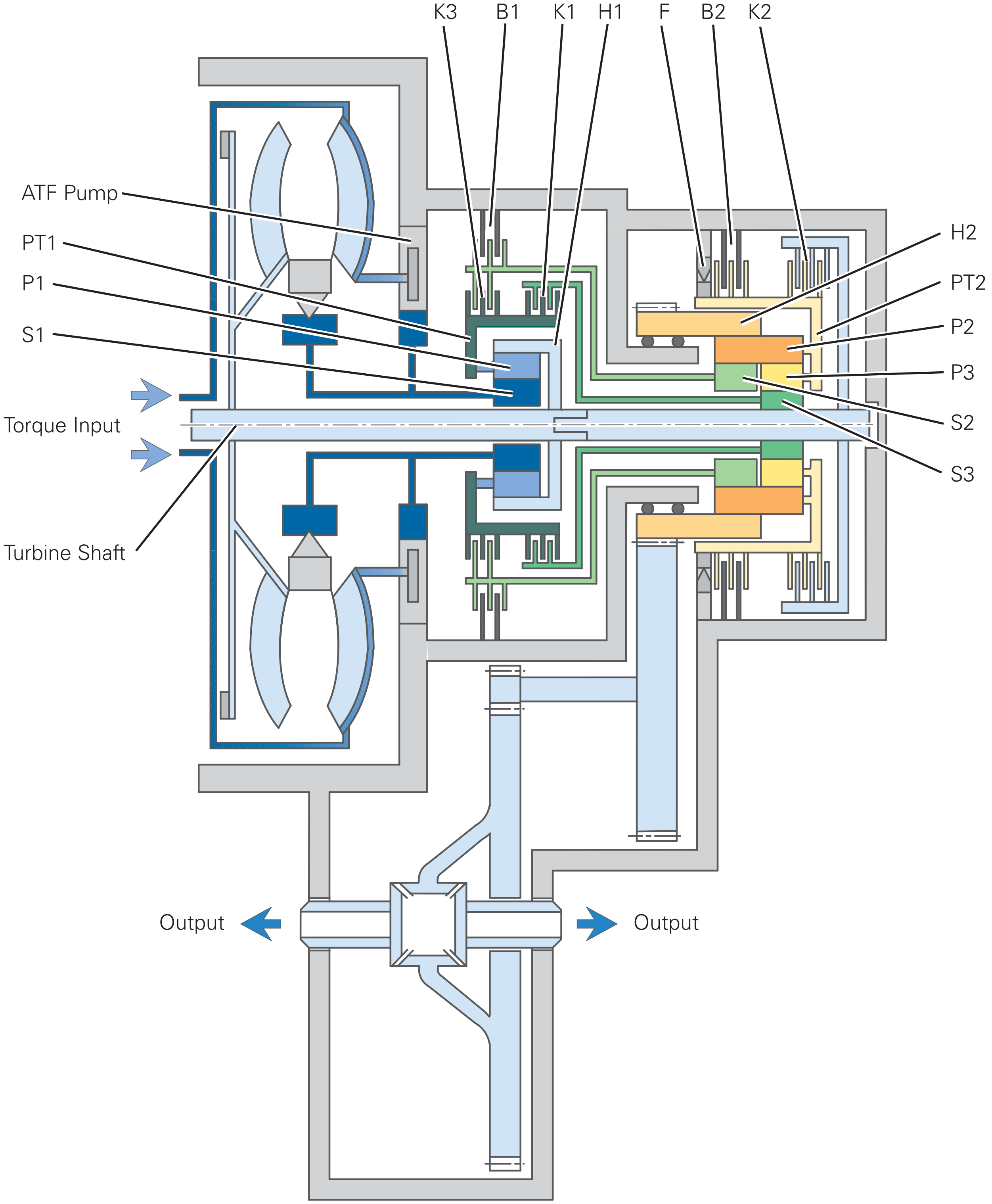
The ATF is cooled by an ATF heat exchanger that is flanged directly on the transmission and is integrated in the engine coolant circuit. Because of this, the ATF circuit remains closed and requires no additional ATF lines.

The "closed ATF circuit" simplifies filling and checking the ATF level. Disconnecting the ATF lines is not required when removing and installing the transmission.

ATF Cooling Circuit in 2005 Jetta/2006 Passat


Engine Coolant Circuit 2005 Jetta
Engine Radiator
Air Stream
ATF Cooler
ATF Circuit

Section - Automatic Transmission


K3
B1
K1
H1
F
B2
K2
ATF Pump
PT1
P1
S1
Torque Input
Turbine Shaft
H2
PT2
P2
P3
S2
S3
Output
Output

Simple Planetary Gear Set

Component:	Connected to:
Internal Gear - H1	Turbine Shaft (Power Train)/Clutch K2
Planetary Gears 1 - P1	Power transfer in Planetary Gear Set
Sun Gear - S1	Fixed
Planet Carrier - PT1	Clutch K1/K3

Double Planetary Gear Set

Component:	Connected to:
Internal Gear - H2	Output
Planetary Gears Long - P2	Power transfer in Planetary Gear Set
Planetary Gears Short - P3	Power transfer in Planetary Gear Set
Sun Gear Large - S2	Clutch K3/BrakeB1
Sun Gear Small - S3	Clutch K1
Planet Carrier - PT2	Clutch K2/Brake B2/Freewheel F

Clutches, Brakes, Freewheel

Component:	Connected to:
Clutch - K1	Planet Carrier PT1 (Simple Planetary Gear Set) with the Small Sun Gear S3 (Secondary Gear Set).
Clutch - K2	Turbine Shaft (Power Train) with the Planet Carrier PT2 of the Double Planetary Gear Set.
Clutch - K3	Planet Carrier PT1 (Simple Planetary Gear Set) with the Large Sun Gear S2 (Secondary Gear Set).
Brake - B1	Secures the Large Sun Gear S2 (Secondary Gear Set).
Brake - B2	Secures the Planet Carrier PT2 (Secondary Gear Set).
Freewheel - F	Secures the Planet Carrier PT2 (Secondary Gear Set) against the Power Train Rotational Direction. In use for 1st Gear Driving Mode (no engine brake).

Park Lock

The park lock secures the parked vehicle from rolling away. It is mechanically operated by the selector lever via the selector lever cable, the selector shaft, and a linkage with pin and compression spring.

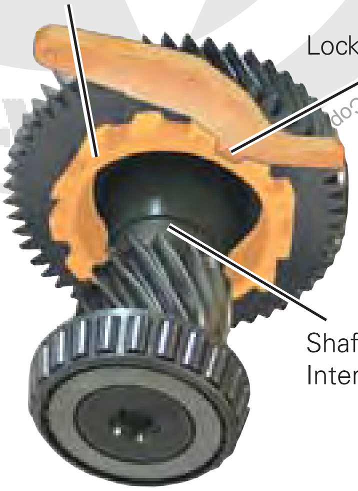
The park lock wheel is integral with the driven gear of the intermediate shaft. It simultaneously serves as the sensor wheel for the Transmission Output Speed (RPM) Sensor G195.

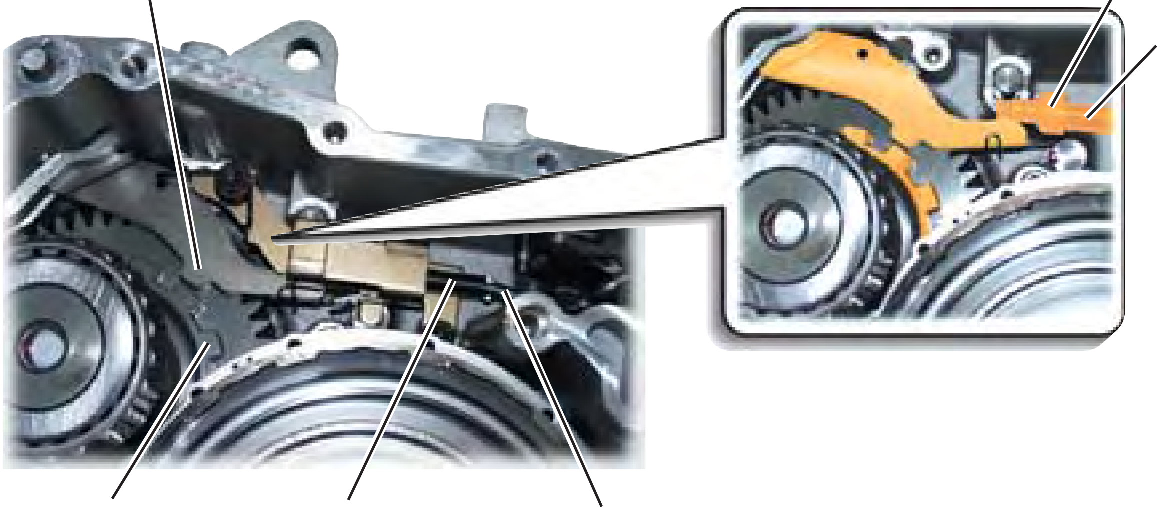
The locking pawl engages in the teeth of the park lock wheel to lock the final drive. There is an adjustment/equalization of the wheels the axle is partially raised.

Securing against rolling away for a partially raised front axle (e.g., when changing tires using the car jack) is not possible. It is imperative to use the parking brake.

When on a steep incline, the parking brake should be used before engaging the selector lever position "P" to protect the selector lever cable and to ease the operation of the selector lever.

Tension between the locking pawl and the park lock wheel is thus prevented. When driving away, the selector lever must first be shifted out of "P" and the parking brake must be released next.


Park Lock Wheel
Locking Pawl
Shaft
Intermediate Drive


Locking Pawl
Pin
Compression
Spring
Park Lock Wheel
Compression
Spring
Linkage

Hydraulic Control

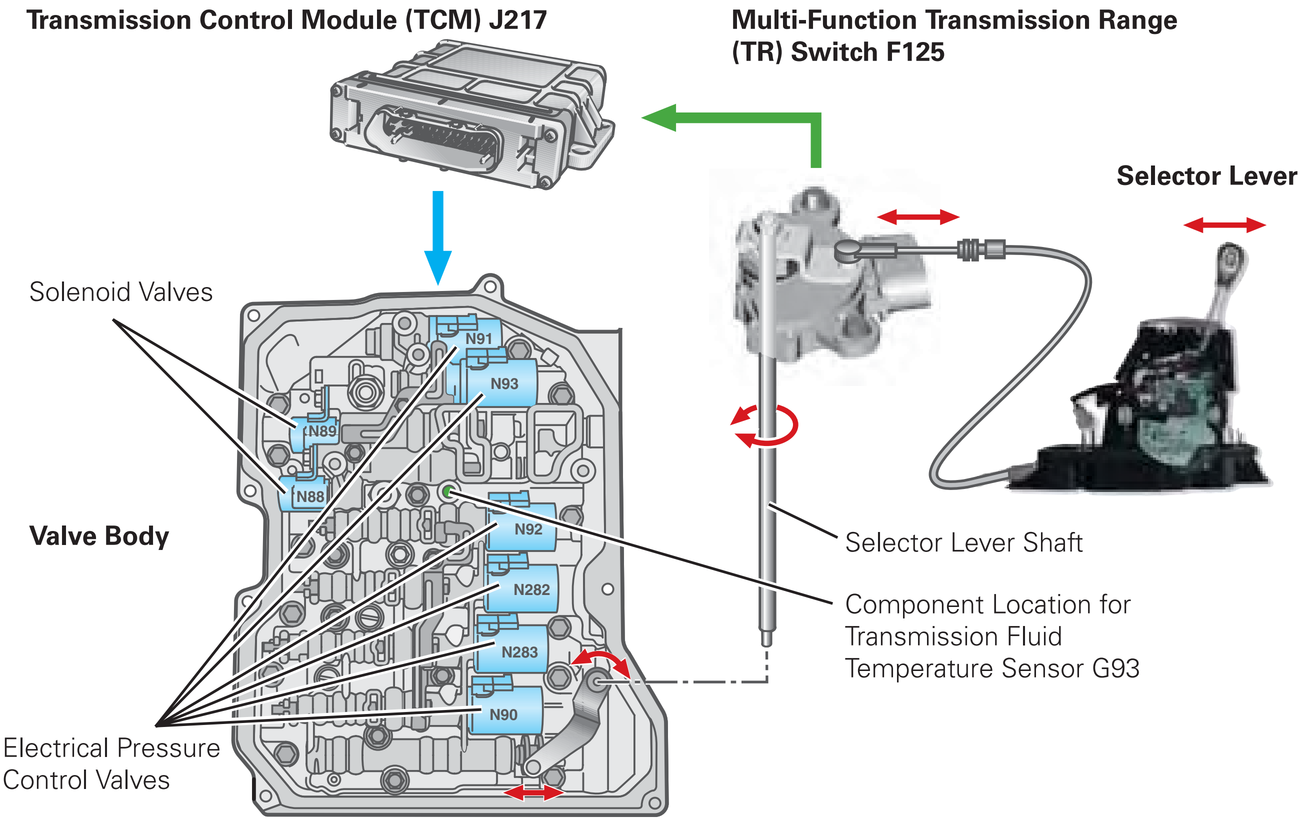
Valve Body

The clutches and brakes (shifting elements) are controlled by the valve body via hydraulic valves. These valves are activated by solenoid valves that in turn are activated by the Transmission Control Module (TCM) J217.

In addition to the shifting elements, the valve body controls the torque converter lock-up clutch and the ATF pressure in the transmission (e.g., main pressure, control pressure, converter pressure, and lubrication pressure).

The valve body contains the following components:

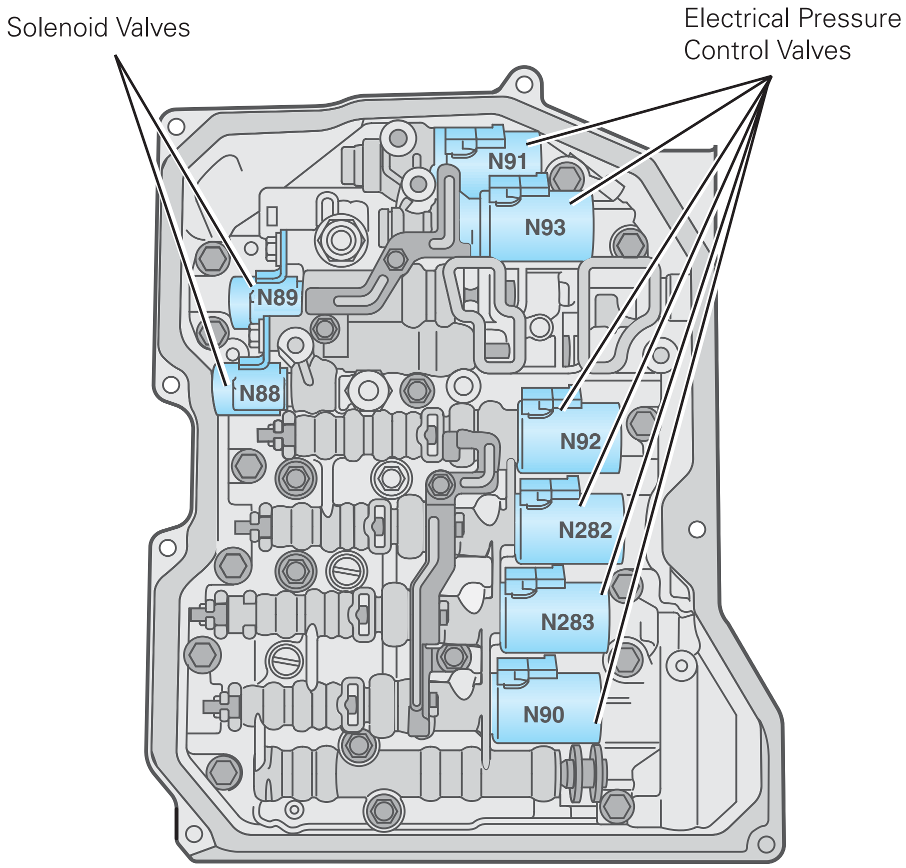
- The mechanically operated selector valve.
- The hydraulically controlled solenoid valves.
- Six electrically controlled pressure control valves.
- The Transmission Fluid Temperature Sensor G93.


Transmission Control Module (TCM) J217
Multi-Function Transmission Range (TR) Switch F125
Selector Lever
Solenoid Valves
N91
N93
N89
N88
Valve Body
N92
N282
N283
N90
Electrical Pressure Control Valves
Selector Lever Shaft
Component Location for Transmission Fluid Temperature Sensor G93

Solenoid Valves

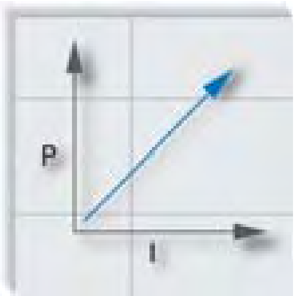
There are two types of solenoid valves: solenoid valves with two shifting positions (on/off) and electrical pressure control valves (modulation valves).

Solenoid Valve 1 N88 and Solenoid Valve 2 N89 are so-called on/off valves. Through these, hydraulic valves are activated using ATF pressure and thereby an ATF channel is opened or closed.


Solenoid Valves
Electrical Pressure Control Valves
N91
N93
N89
N88
N92
N282
N283
N90

Electrical Pressure Control Valves

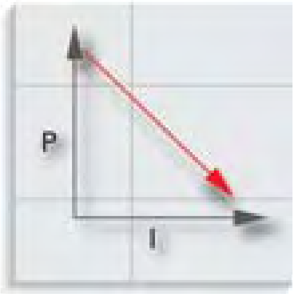
Electrical pressure control valves convert an electrical current into a proportional hydraulic control pressure. There are two types of pressure control valves installed.



Pressure Control Valves with Rising Characteristic Curve N90 and N91

Pressure control valves with rising characteristic curve increase the control pressure (P) as control current (I) increases: no current means no control pressure (0 mA = 0 bar).

Pressure control valves with falling characteristic curve reduce control pressure (P) as control current (I) increases: maximum current means no control pressure (max mA = 0 bar).



Pressure Control Valves with Falling Characteristic Curve N92, N93, N282 and N283

Function Assignment of Solenoid Valves

Solenoid Valve 3 N90 controls clutch K3

Solenoid Valve 4 N91 controls the torque converter lock-up clutch

Solenoid Valve 5 N92 controls clutch K1

Solenoid Valve 6 N93 controls the main pressure/system pressure

Solenoid Valve 9 N282 controls clutch K2

Solenoid Valve 10 N283 controls brake B1.

Solenoid Valve 1 N88 and Solenoid Valve 2 N89 control the shifting of gears 4 through 6 and are sporadically and alternately activated (supplied with current) during gear shifting.

Solenoid Valve 1 N88 and Solenoid Valve 2 N89 control brake B2 in 1st gear - Tiptronic mode (for the engine brake).

Assignment Table of Multi-disc Clutches and Brakes to Shifted Gear

	Component					
Gear	**K1**	**K2**	**K3**	**B1**	**B2**	**F**
1st Gear	X				*	X
2nd Gear	X			X		
3rd Gear	X		X			
4th Gear	X	X				
5th Gear		X	X			
6th Gear		X		X		
R Gear			X		X	

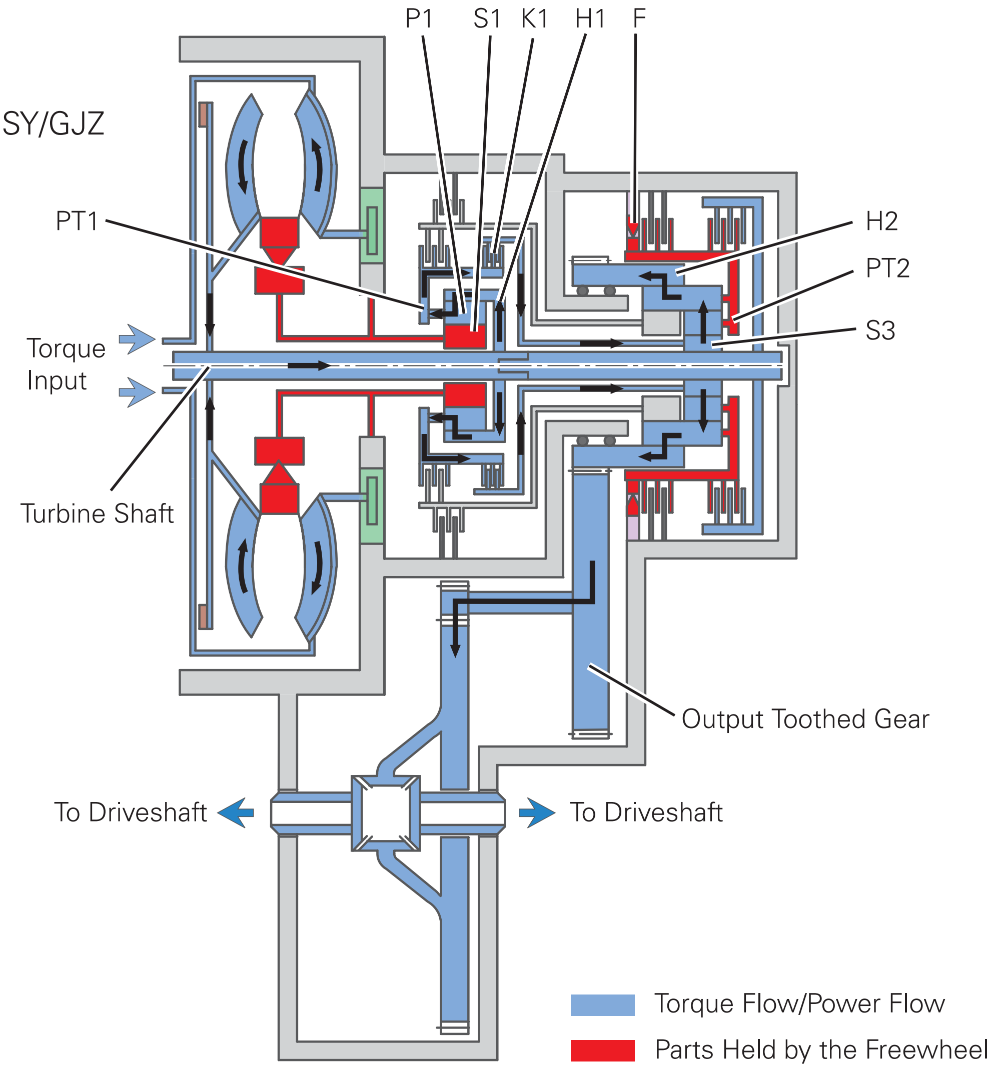
* The "engine brake"

The braking force of the "shifted" engine can be used in particular driving situations such as steep inclines by engaging 1st gear in Tiptronic mode.

The multi-disc brake B2 is closed in 1st gear only in Tiptronic mode.

Torque Flow

1st Gear
Ratio 4.148
Code Letters GSY/GJZ


P1
S1
K1
H1
F
PT1
H2
PT2
S3
Torque Input
Turbine Shaft
Output Toothed Gear
To Driveshaft
To Driveshaft
Torque Flow/Power Flow
Parts Held by the Freewheel

Gear Description - Clutch K1 - Freewheel F

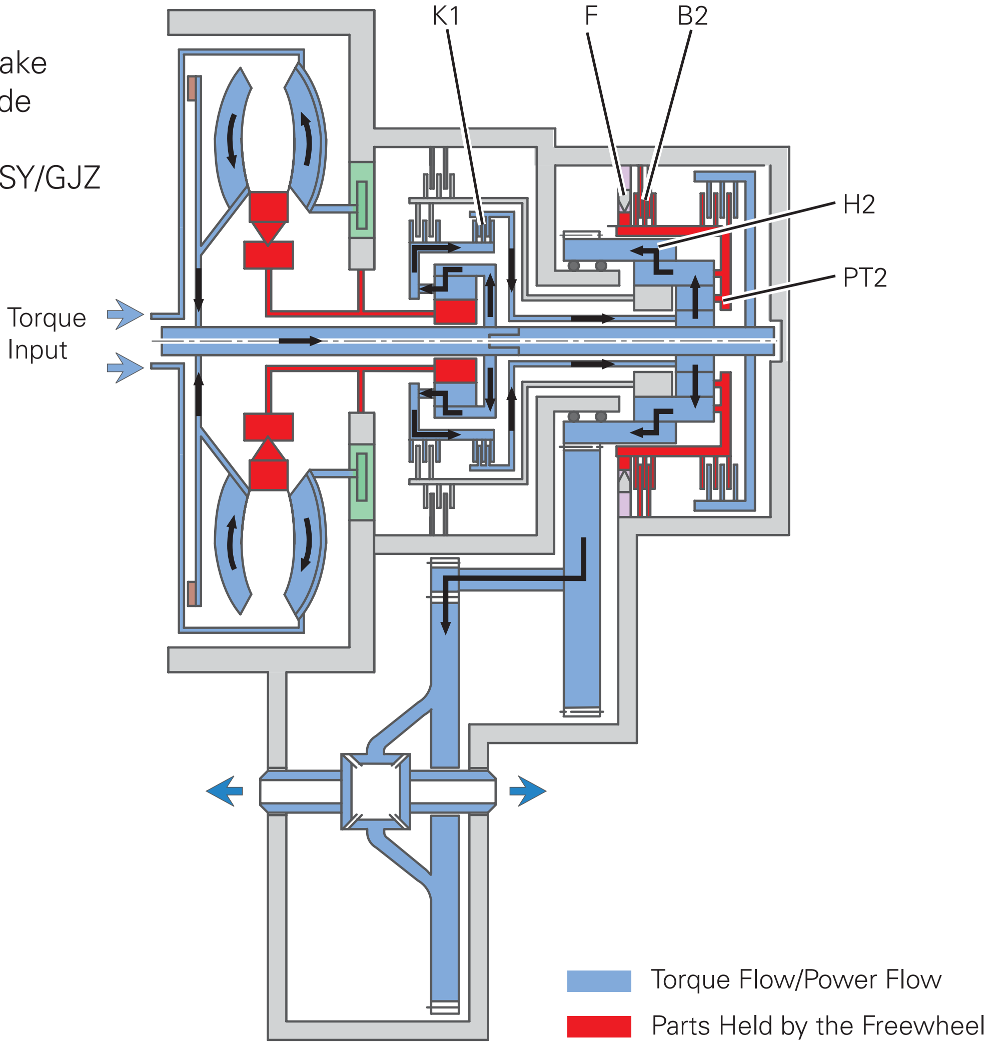
The turbine shaft drives the internal gear H1 of the simple planetary gear set. The internal gear drives the planetary gears P1 that mesh with the supporting stationary sun gear. Planet carrier PT1 is driven through this.

Clutch K1 is closed; the torque is thus transferred to sun gear S3 of the double planetary gear set.

The long planetary gears transfer the torque to the internal gear H2. The internal gear is directly connected to the output toothed gear. The planet carrier PT2 rests on the freewheel F.

Because 1st gear is engaged using the freewheel, the power transfer in 1st gear deceleration mode is nullified. The gears drive in deceleration mode. Freewheel F turns away from its locking direction (in freewheel direction); engine braking cannot be used.

1st Gear
With Engine Brake
in Tiptronic Mode
Ratio 4.148
Code Letters GSY/GJZ


K1
F
B2
H2
PT2
Torque
Input
Torque Flow/Power Flow
Parts Held by the Freewheel

Gear Description - Clutch K1 - Brake B2

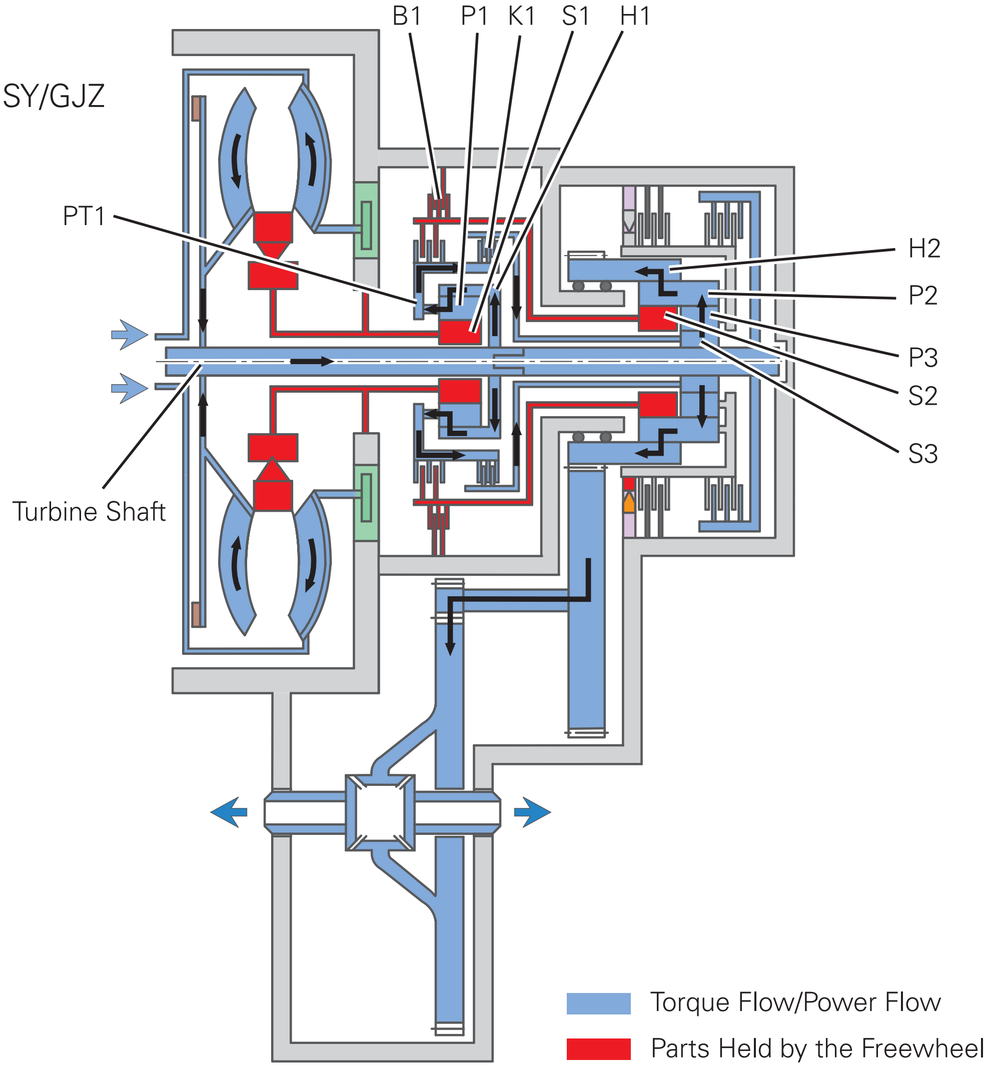
Engine braking in 1st gear can be used in certain driving situations (e.g. for steep inclines) by selecting 1st gear in Tiptronic mode (brake B2 closed).

The torque flow corresponds to the flow as described for 1st gear.

The use of engine braking in 1st gear can only be enabled by engaging brake B2.

Brake B2 locks planetary carrier PT2 like the freewheel F. Unlike freewheel F, however, brake B2 secures planet carrier PT2 in both rotation directions. This is necessary for reverse and also for engine braking in 1st gear.

2nd Gear
Ratio 2.370
Code Letters GSY/GJZ


B1
P1
K1
S1
H1
PT1
H2
P2
P3
S2
S3
Turbine Shaft
Torque Flow/Power Flow
Parts Held by the Freewheel

Gear Description - Clutch K1 - Brake B1

The turbine shaft drives the internal gear H1 of the simple planetary gear set. The internal gear H1 drives the planetary gears P1 that mesh with the supporting stationary sun gear S1. Planet carrier PT1 is driven through this.

Clutch K1 connects planet carrier PT1 to the sun gear S3 and thus transmits torque to the double planetary gear set.

Brake B1 locks the large sun gear S2. The torque is transferred from sun gear S3 to short planetary gears P3 and from there to long planetary gears P2.

Long planetary gears P2 mesh with the stationary sun gear S2 and drive internal gear H2.

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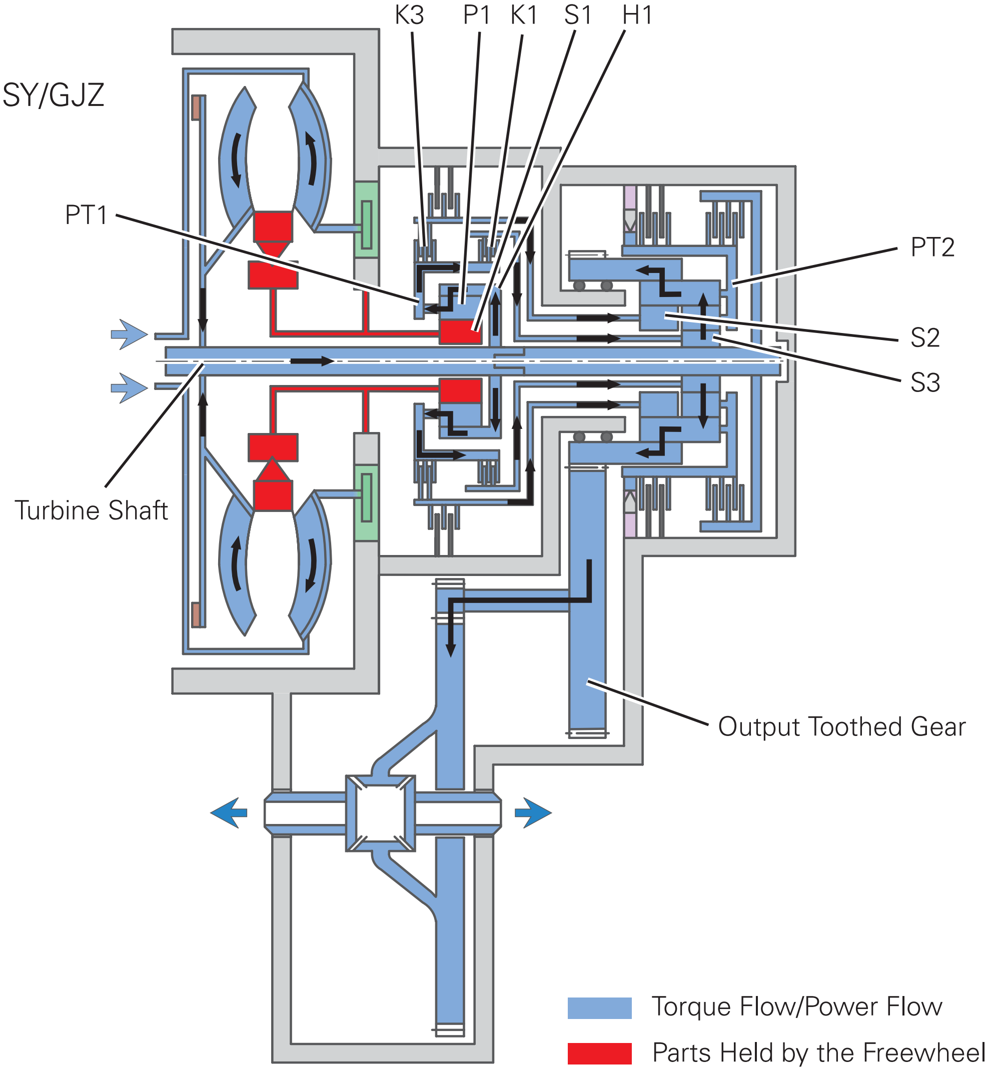
3rd Gear
Ratio 1.556
Code Letters GSY/GJZ


K3
P1
K1
S1
H1
PT1
PT2
S2
S3
Turbine Shaft
Output Toothed Gear
Torque Flow/Power Flow
Parts Held by the Freewheel

Gear Description - Clutch K1 - Clutch K3

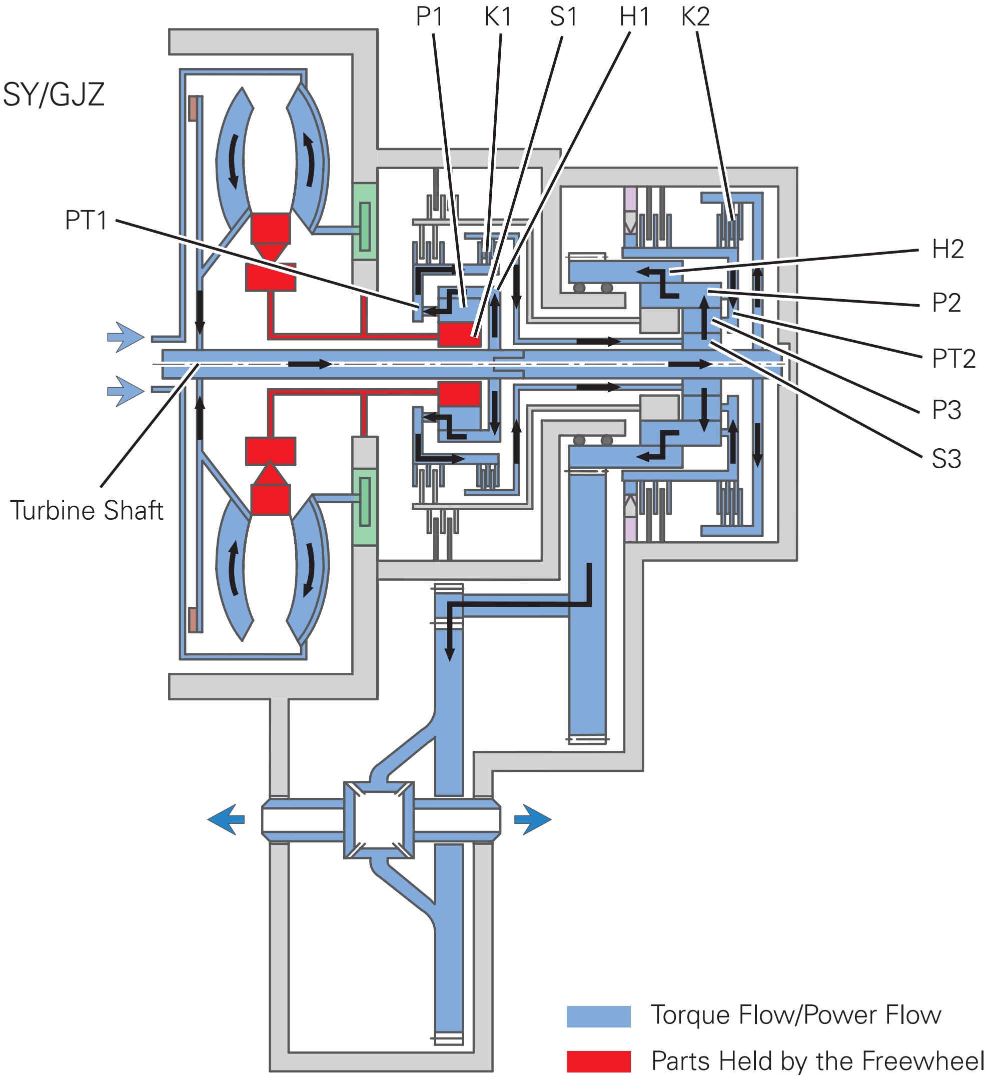
The turbine shaft drives the internal gear H1 of the simple planetary gear set. The internal gear H1 drives the planetary gears P1 that mesh with the supporting stationary sun gear S1. Planet carrier PT1 is driven through this.

Clutch K1 connects planet carrier PT1 to the sun gear S3 and thus transmits torque to the double planetary gear set.

Clutch K3 also transmits torque to the double planetary gear set on sun gear S2. By engaging both clutches K1 and K3, the double planetary gear set is locked. Torque is then directly transferred from the planetary gear set to the output toothed gear.

4th Gear

Ratio 1.155
Code Letters GSY/GJZ


P1
K1
S1
H1
K2
PT1
H2
P2
PT2
P3
S3
Turbine Shaft
🟦 Torque Flow/Power Flow
🟥 Parts Held by the Freewheel

Gear Description - Clutch K1 - Clutch K2

The turbine shaft drives the internal gear H1 of the simple planetary gear set and the outer disc carrier of clutch K2.

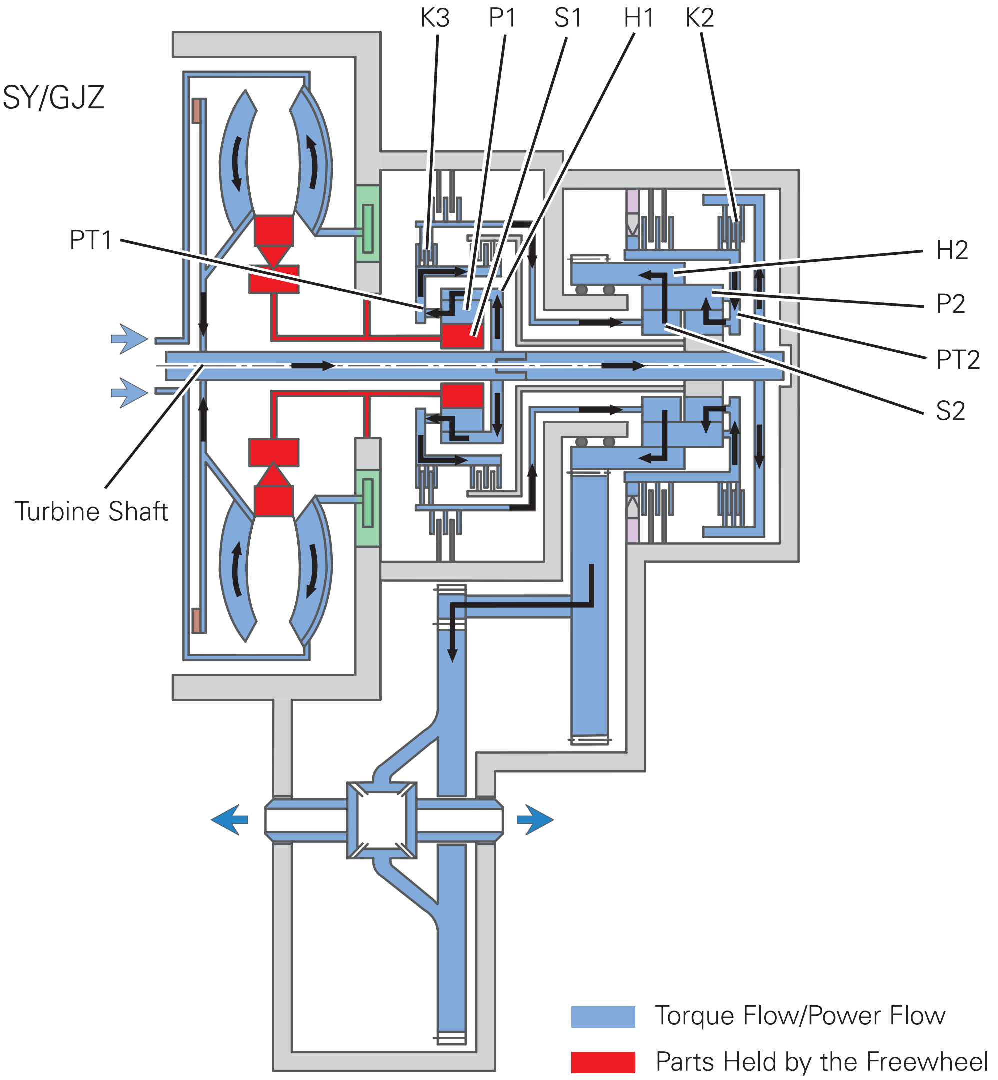
The internal gear H1 drives the planetary gears P1 that mesh with the supporting stationary sun gear S1. Planet carrier PT1 is driven through this.

Clutch K1 connects planet carrier PT1 to the sun gear S3 and thus transmits torque to the double planetary gear set.

Clutch K2 connects the turbine shaft to planet carrier PT2 and thus also transmits torque to the double planetary gear set.

Long planetary gears P2, which are engaged with the short planetary gears P3, drive the internal gear H2 along with planet carrier PT2.

5th Gear
Ratio 0.859
Code Letters GSY/GJZ


K3
P1
S1
H1
K2
PT1
H2
P2
PT2
S2
Turbine Shaft
Torque Flow/Power Flow
Parts Held by the Freewheel

Gear Description - Clutch K2 - Clutch K3

The turbine shaft drives the internal gear H1 of the simple planetary gear set and the outer disc carrier of clutch K2.

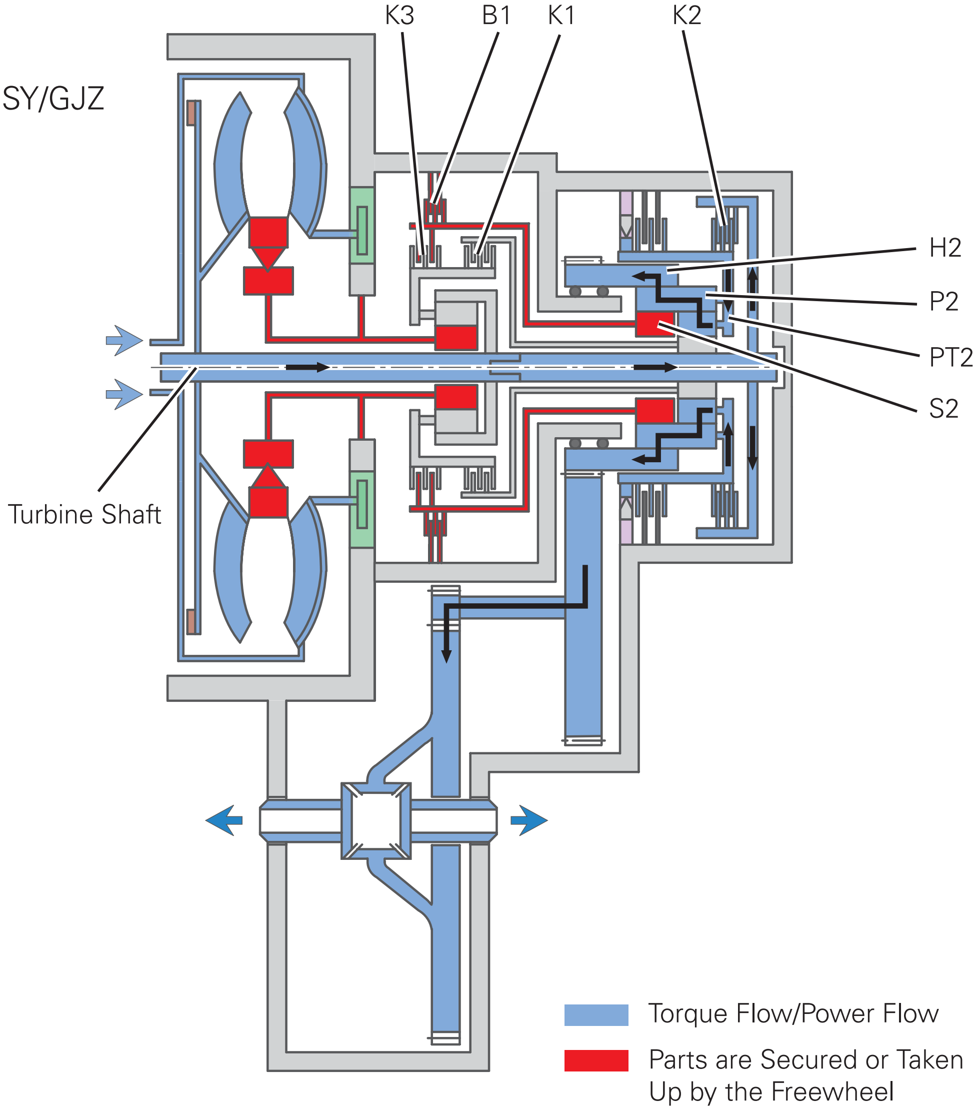
The internal gear H1 drives the planetary gears P1 that mesh with the supporting stationary sun gear S1. Planet carrier PT1 is driven through this.

Clutch K3 connects planet carrier PT1 to the sun gear S2 and thus transmits torque to the double planetary gear set.

Clutch K2 connects the turbine shaft to planet carrier and thus also transmits torque to the double planetary gear set.

Long planetary gears P2 drive the internal gear H2 along with planet carrier PT2 and sun gear S2.

6th Gear
Ratio 0.686
Code Letters GSY/GJZ


K3
B1
K1
K2
H2
P2
PT2
S2
Turbine Shaft
🟦 Torque Flow/Power Flow
🟥 Parts are Secured or Taken Up by the Freewheel

Gear Description - Clutch K2 - Brake B1

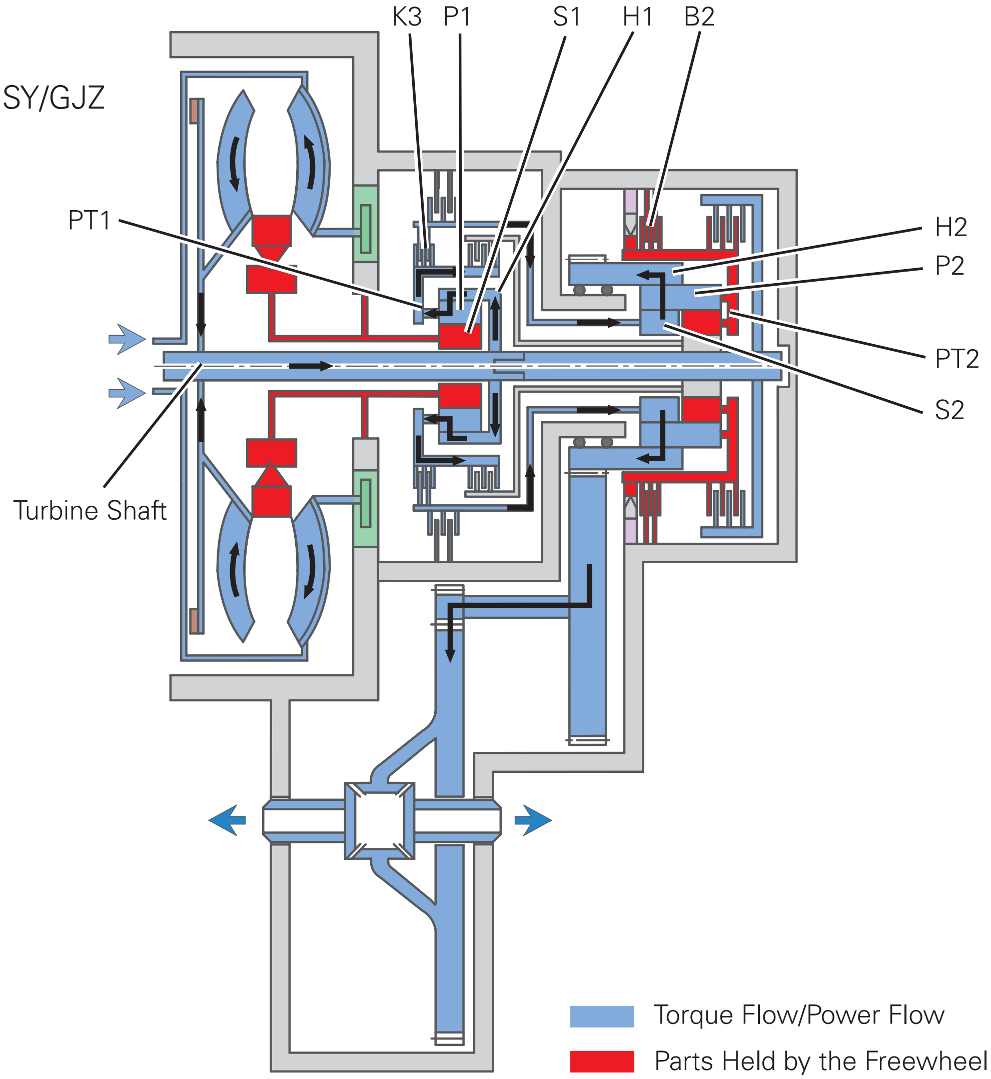
Brake B1 locks sun gear S2.

Clutch K2 connects turbine shaft to the planet carrier of the double planetary gear set and thus transmits torque to the double planetary gear set.

Long planetary gears P2 mesh with the stationary sun gear S2 and drive internal gear H2.

Clutches K1 and K3 are not engaged. The simple planetary gear set does not contribute to the power flow.

Reverse
Ratio 3.394
Code Letters GSY/GJZ


K3
P1
S1
H1
B2
PT1
H2
P2
PT2
S2
Turbine Shaft
🟦 Torque Flow/Power Flow
🟥 Parts Held by the Freewheel

Gear Description - Clutch K3 - Brake B2

The turbine shaft drives the internal gear H1 of the simple planetary gear. The internal gear H1 drives the planetary gears P1 that mesh with the supporting stationary sun gear S1. Planet carrier PT1 is driven through this.

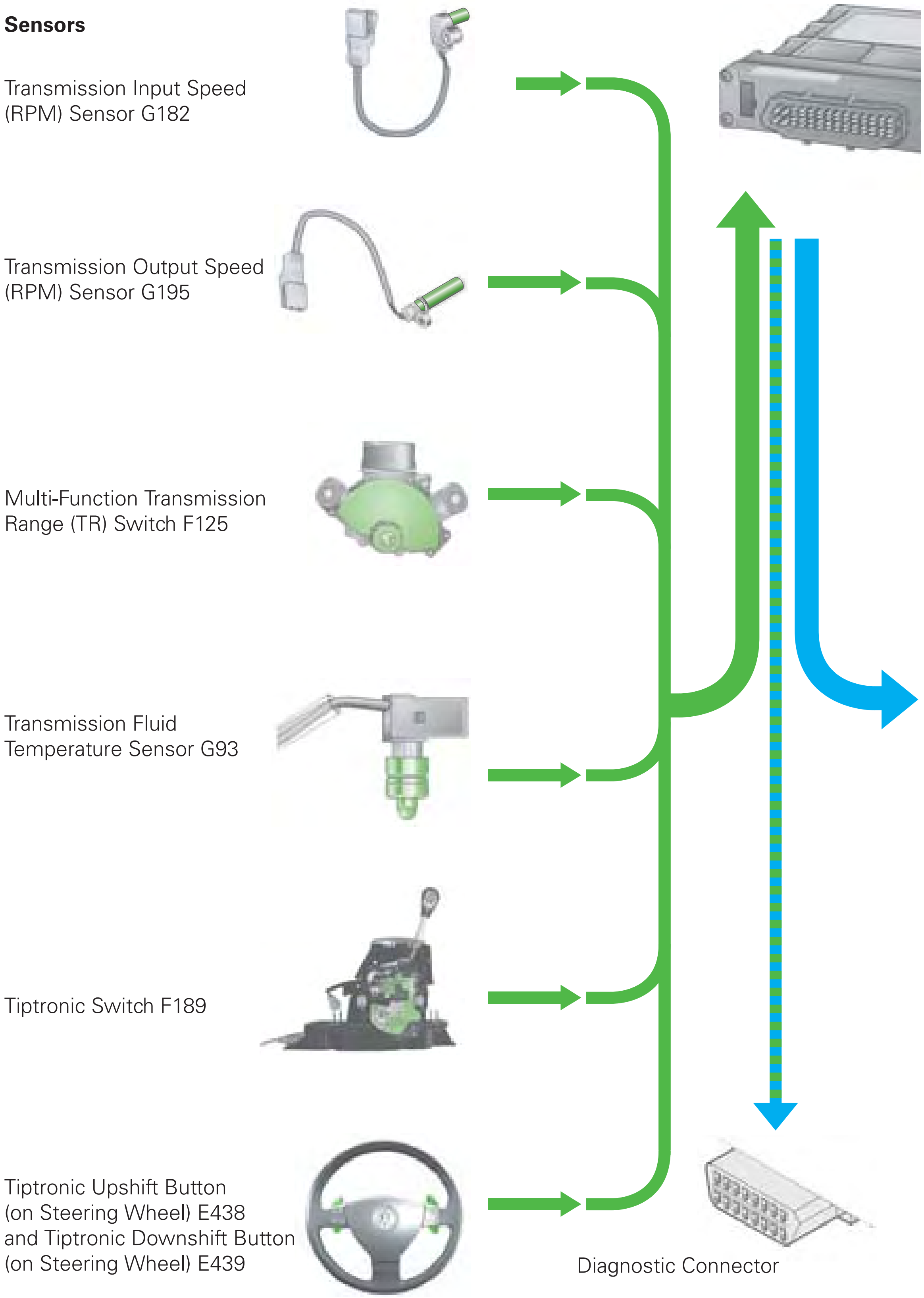
Clutch K3 connects planet carrier PT1 to the sun gear S2 and thus transmits torque to the double planetary gear set.

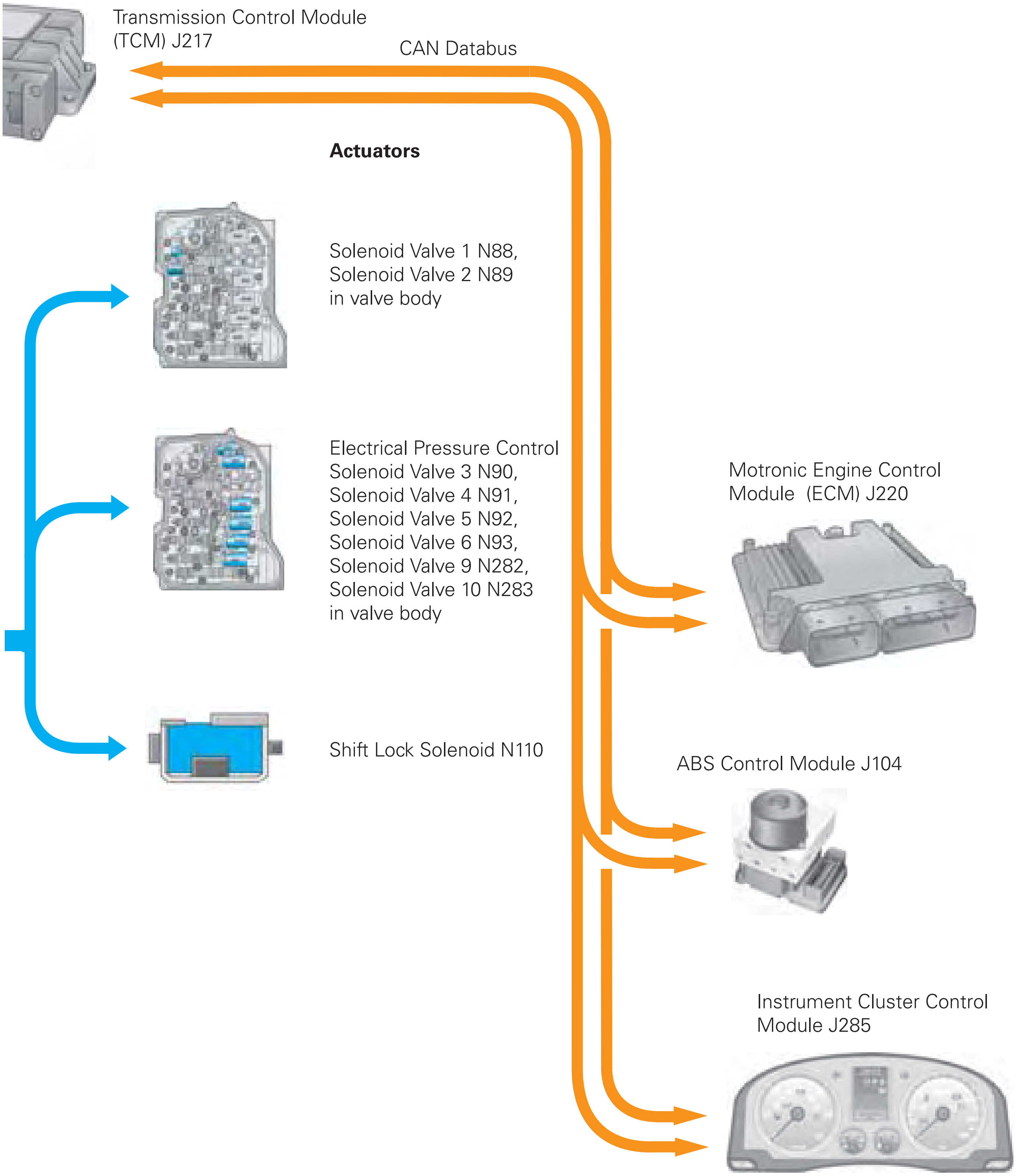
Brake B2 locks planet carrier PT2 in the double planetary gear set. Torque is transferred from sun gear S2 to the long planetary gear P2.

Torque from planet carrier PT2 is transferred to internal gear H2, which is connected to the output shaft.

Internal gear H2 is therefore driven in the opposite direction of the engine rotation.

Example: 2005 Jetta


Sensors
Transmission Input Speed (RPM) Sensor G182
Transmission Output Speed (RPM) Sensor G195
Multi-Function Transmission Range (TR) Switch F125
Transmission Fluid Temperature Sensor G93
Tiptronic Switch F189
Tiptronic Upshift Button (on Steering Wheel) E438 and Tiptronic Downshift Button (on Steering Wheel) E439
Diagnostic Connector



Transmission Control Module
(TCM) J217

CAN Databus

Actuators

Solenoid Valve 1 N88,
Solenoid Valve 2 N89
in valve body

Electrical Pressure Control
Solenoid Valve 3 N90,
Solenoid Valve 4 N91,
Solenoid Valve 5 N92,
Solenoid Valve 6 N93,
Solenoid Valve 9 N282,
Solenoid Valve 10 N283
in valve body

Shift Lock Solenoid N110

Motronic Engine Control
Module (ECM) J220

ABS Control Module J104

Instrument Cluster Control
Module J285

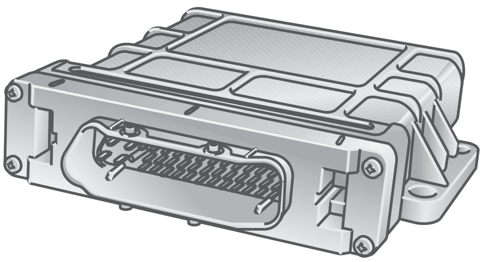
Transmission Control Module (TCM) J217

The control module is connected to the vehicle by a 52-pin connector. The VAS 1598/48 adapter cable is available for static and dynamic system measurements.

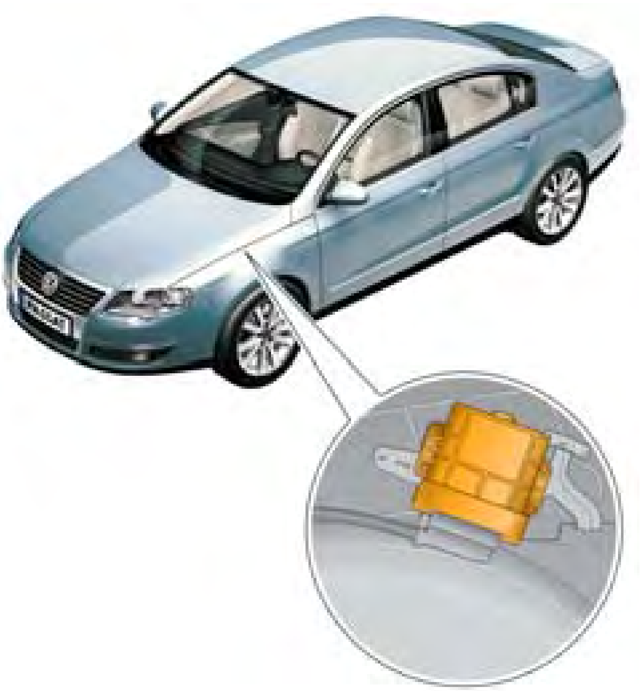
The manufacturer of the control module is AISIN AW Japan.

Update Programming is possible using VAS 5051and VAS 5052.

Transmission Control Module (TCM) J217



Component Location in 2006 Passat Beneath the Left Front Wheel Housing Cover



Dynamic Shifting Program DSP

This automatic transmission has the latest generation Dynamic Shifting Program DSP.

The driving conditions, as well as for example the driving resistance (e.g., climbing), the road profile (e.g., curve), and the driver type (manner of driving) are evaluated.

The basic parameters for the calculation of the gear selection have not fundamentally changed compared to previous automatic transmissions. Due to the constantly increasing integration of the transmission control with other vehicle systems, such as the engine, ESP, or the steering angle sensor, a large amount of information is available to better define the current driving conditions and the driving manner.

Sport Mode “S”

A performance-oriented shifting program is available to the driver in selector lever position “S”.

If the Transmission Control Module (TCM) J217 recognizes the selector lever position “S”, the shifting characteristic curves are reallocated to higher engine speeds. This increases the driving dynamic.

The DSP also adapts to driver input (driver type evaluation) and driving situations in “S” position.

The “S” mode contains the following characteristics:

- If the selector lever is placed in “S” while driving with an unchanging accelerator pedal position, a downshift occurs within defined limits.
- To achieve a more direct driving reaction to the movements of the accelerator pedal, the torque converter lock-up clutch closes as soon as possible.

If 6th gear is designed as the E-gear for the overall transmission ratio, only gears 1 through 5 are used.

Emergency Running Mode

In mechanical emergency running mode, 3rd gear is always engaged in driving operation up to 3rd gear.

If the transmission is already in 4th, 5th, or 6th gear, the current gear is maintained until the selector lever is put into neutral position or the engine is stopped.

When starting off, 3rd gear is always engaged in selector lever position “D” or “S”.

Reverse gear is available (R-gear locking is not active).

Towing

When towing, the ATF pump is not operated, and therefore rotating components are not lubricated.

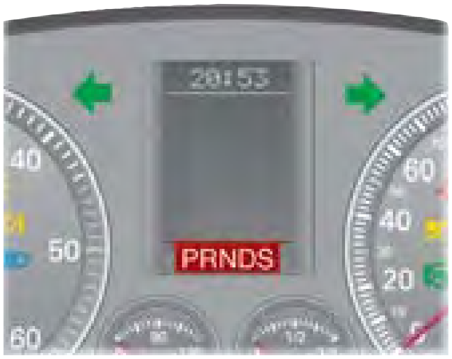
To avoid severe damage to the transmission, the following conditions must be met without fail:

- The selector lever must be in “N” position.
- Towing speed must not exceed 31 mph (50 km/h).
- Vehicle must not be towed farther than 31 miles (50 km).

For Jetta and Passat, if the battery is disconnected or discharged, the selector lever emergency release must be operated to shift the selector lever out of “P” into “N”.

System pressure is controlled to the maximum value; the shifting elements are thus pressurized to maximum shifting pressure. This results in hard shift bucking when engaging the driving mode.

The torque converter lock-up clutch remains open.

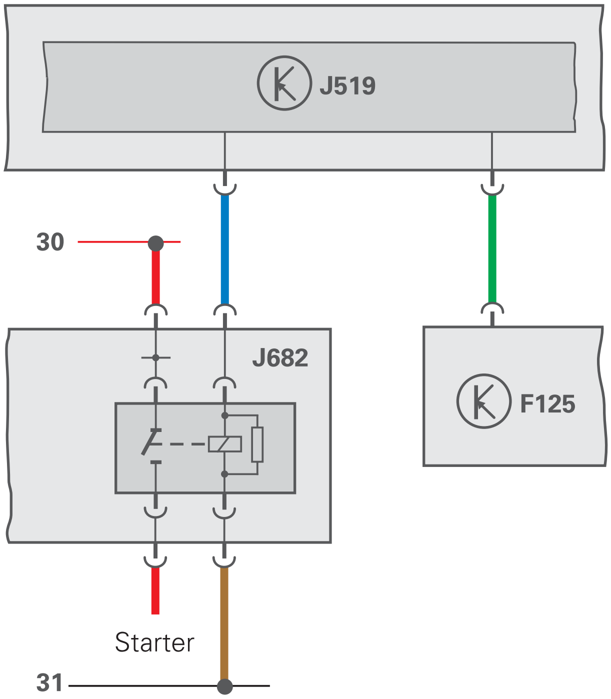


Starter Interlock, Back-up Light

The starter interlock (control of starter terminal 50) and back-up light control functions are controlled by the Vehicle Electrical System Control Module J519. The starter interlock prevents engine start if the selector lever is in a driving position.

Engine Start - 2005 Jetta

If the selector lever is in "P" or "N" positions, the Vehicle Electrical System Control Module J519 receives a signal from the Multi-Function Transmission Range (TR) Switch F125. The Vehicle Electrical System Control Module J519 activates the Power Supply Relay (terminal 50) J682 after the signal. The relay activates and supplies terminal 50 of the starter with voltage.



Back-up Light

The information "reverse gear" is initially transmitted to the Transmission Control Module (TCM) J217 by the Multi-Function Transmission Range (TR) Switch F125. The Transmission Control Module (TCM) J217 stores this information on the powertrain CAN. By means of the Data Bus On Board Diagnostic Interface J533, the information arrives via the Comfort CAN at the Vehicle Electrical System Control Module J519, which activates the back-up lights.

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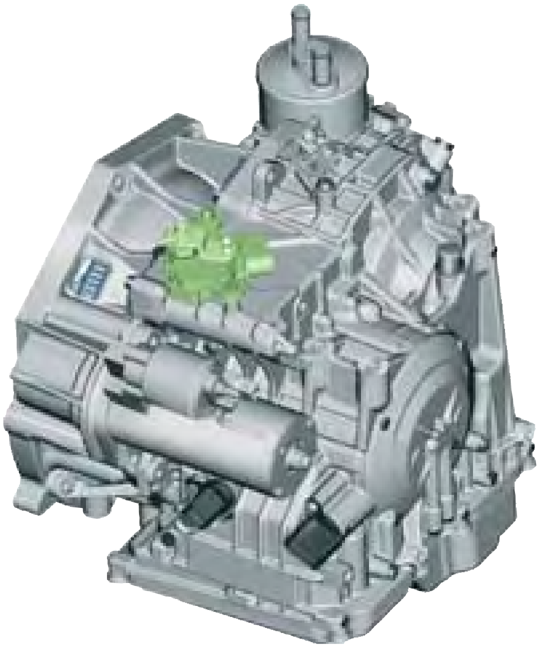
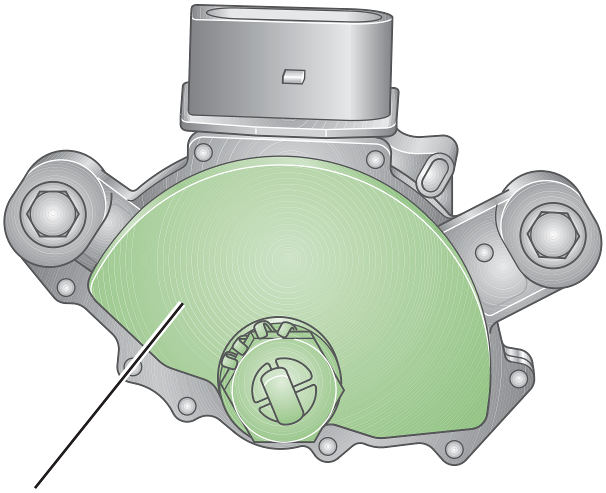
Sensors

Multi-Function Transmission Range (TR) Switch F125

The multi-function switch is connected to the selector lever by the selector lever cable.

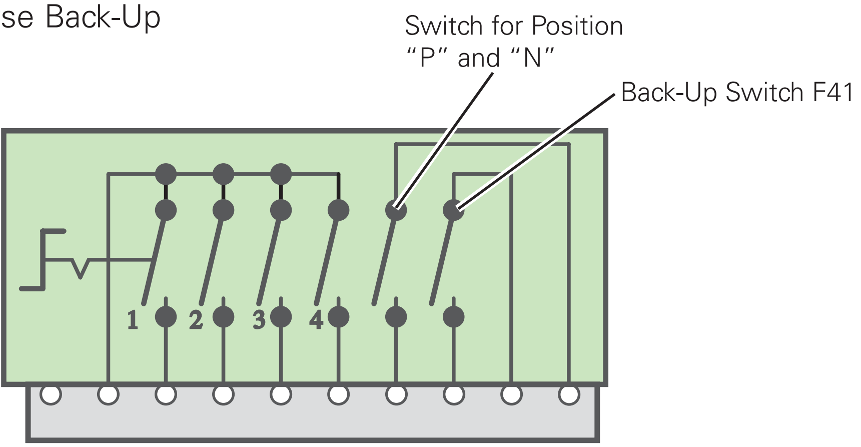
It converts the mechanical movement of the selector lever into electrical signals and sends these signals to the Transmission Control Module (TCM) J217.





The multi-function switch is a mechanical multiple-switch with six sliding contacts:

- Four switches for selector slider position.
- One switch for position “P” and “N” for start control.
- One switch for reverse Back-Up Switch F41.



Switch for Position “P” and “N”

Back-Up Switch F41

Switches 1 Through 4 for Selector Lever Positions

Signal Utilization

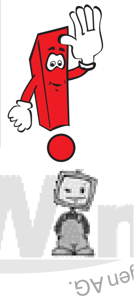
The Transmission Control Module (TCM) J217 triggers the automatic shifting program corresponding to the position of the multi-function switch and controls the following functions:

- Starter interlock
- Back-up lights
- Selector lever lock P/N

The Transmission Control Module (TCM) J217 stores the current selector lever position on the CAN bus for the use of other control modules.

Effects of Signal Failure

As long as the difference between forward and reverse gears can be determined, there are no effects on the shifting program. If the reverse gear signal is faulty, the transmission enters the emergency running mode.



The multi-function switch must be adjusted if:

- It was replaced.
- A new transmission was installed.
- The gear indicator in the instrument panel displays incorrectly.

Transmission Input Speed (RPM) Sensor G182

The Transmission Input Speed (RPM) Sensor G182 records the transmission input RPM at the outer disc carrier of clutch K2.

It works according to the Hall principle.

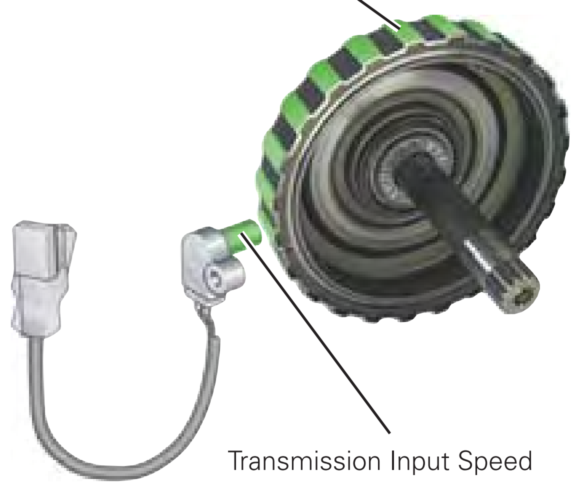
Signal Utilization

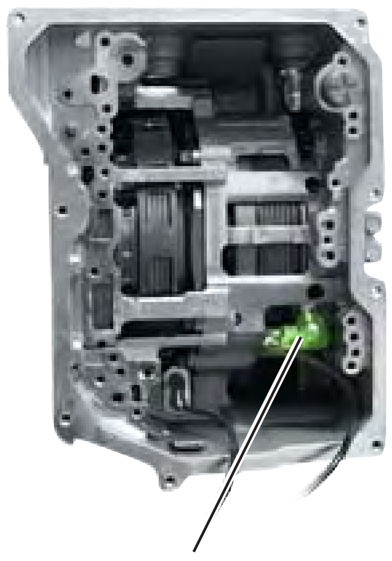
The Transmission Control Module (TCM) J217 requires accurate input RPM for the following functions:

- Control, adaptation, and monitoring of gear shifting.
- Regulation and monitoring of torque converter lock-up clutch.
- Diagnostic of the shifting elements and plausibility checking of engine RPM and transmission output RPM.

Effects of Signal Failure

The torque converter lock-up clutch is closed. Engine RPM is used as replacement RPM.


Sensor Wheel for Transmission Input Speed (RPM) Sensor G182 Outer Disc Carrier K2
Transmission Input Speed (RPM) Sensor G182


Transmission Input Speed (RPM) Sensor G182

Transmission Output Speed (RPM) Sensor G195

The Transmission Output Speed (RPM) Sensor G195 records the transmission output RPM at the park lock wheel. It works according to the Hall principle.

The park lock wheel is integral with the driven gear of the intermediate shaft. Because of the ratio between output planetary gear and intermediate shaft, both RPMs are respectively proportional. The Transmission Control Module (TCM) J217 calculates the actual transmission output RPM based on the programmed transmission ratio.

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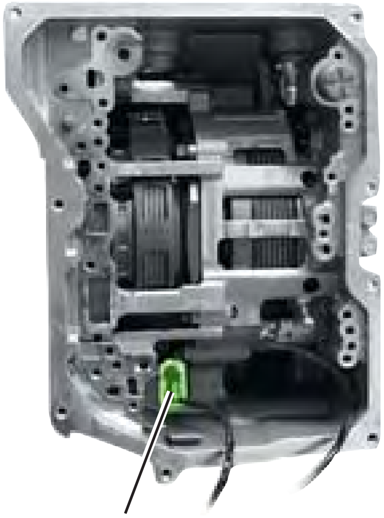
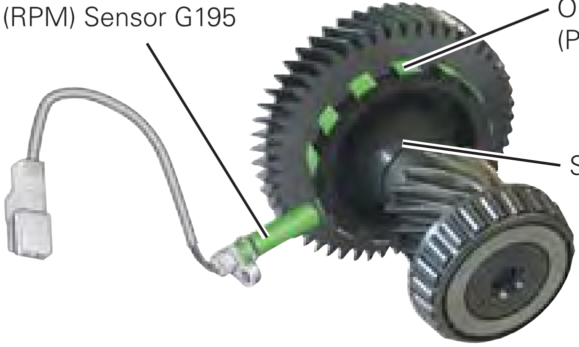

Transmission Output Speed (RPM) Sensor G195


Transmission Output Speed (RPM) Sensor G195
Sensor wheel for Transmission Output Speed (RPM) Sensor G195 (Park Lock Wheel)
Shaft Intermediate Drive

Signal Utilization

Transmission output RPM is one of the most important signals for the electronic transmission control. It occurs in proportion to driving speed and is required for the following functions:

- Selection of the shifting points
- Functions of the Dynamic Shifting Program DSP (e.g., driving condition evaluation)
- Diagnostic of the shifting elements and plausibility checking of the engine and turbine RPM

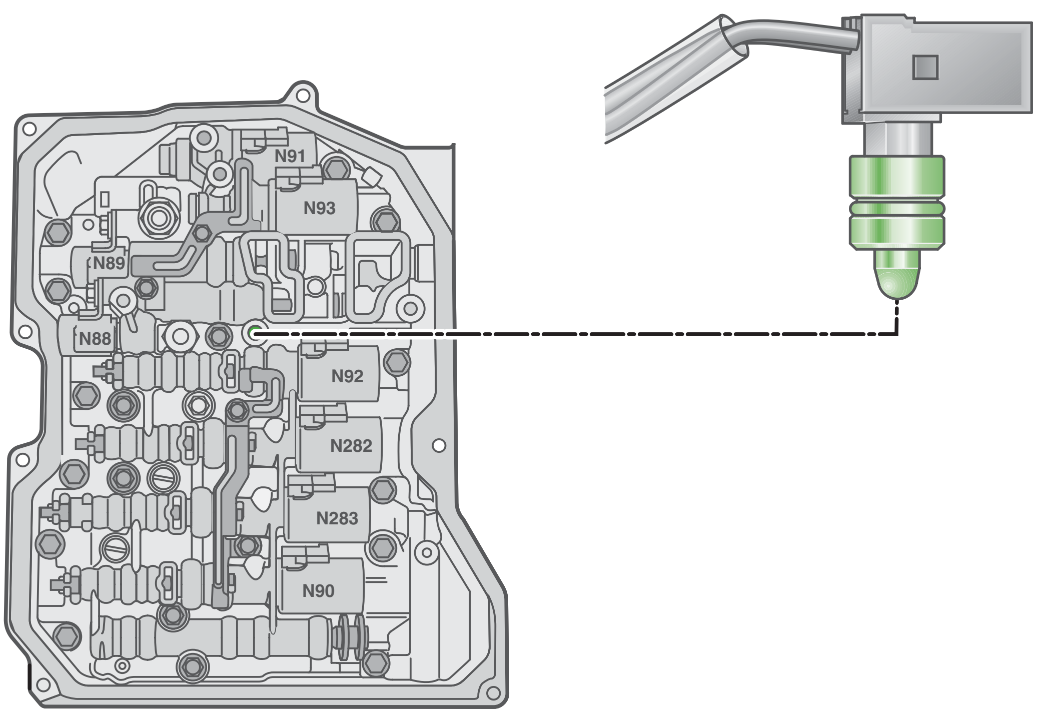
Effects of Signal Failure

The speed signal of the ABS Control Module J104 is used as replacement RPM.

Transmission Fluid Temperature Sensor G93

The Transmission Fluid Temperature Sensor G93 is located inside the valve body immersed in the ATF. It measures ATF temperature and transmits it to the Transmission Control Module (TCM) J217.

The Transmission Fluid Temperature Sensor G93 is secured by a mounting plate. It is part of the line assembly and works as a thermal resistor.



Signal Utilization

The ATF temperature is required for the following functions:

- To adapt the shifting pressure (system pressure) as well as the pressure build-up and release during shifting.
- To activate or deactivate temperature-dependent functions (warm-up program, torque converter lock-up clutch, etc.).
- To activate transmission protective measures at high ATF temperatures (Hot mode).

Effects of Signal Failure

- A replacement value is created from the engine temperature and the operating duration.
- No regulated operation of the torque converter lock-up clutch (only open or closed).
- No adaptation of the shifting pressures (which typically leads to harder shifting).

NTC thermal resistor characteristic curve of Transmission Fluid Temperature Sensor G93

With increasing temperature, the electrical resistance decreases.

Transmission Protection Measures

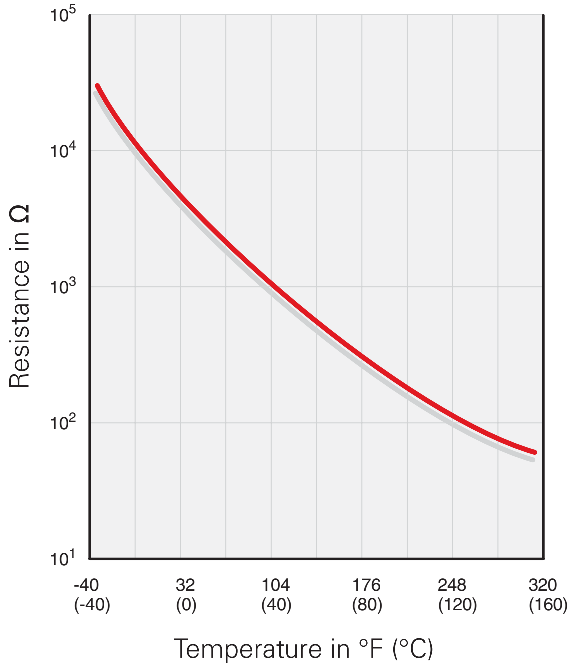
To protect against overheating the transmission, countermeasures are triggered when defined ATF temperatures are exceeded:

Countermeasure 1 (approx. 127 °C):

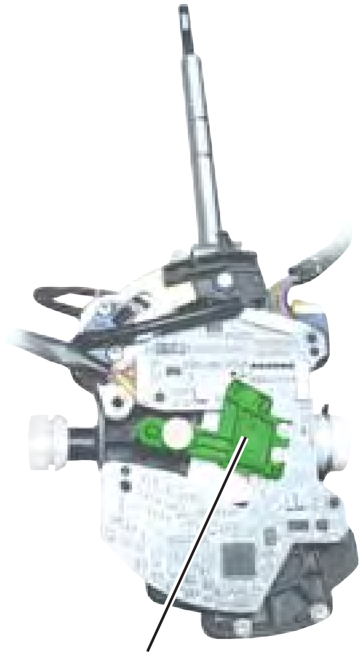
Using the DSP function, the shifting characteristic curves are shifted to higher RPMs. The torque converter lock-up clutch is closed earlier and is no longer regulated.

Countermeasure 2 (approx. 150 °C):

Engine torque is reduced.



In 2005 Jetta



Tiptronic Switch F189

The Tiptronic switch is located in the circuit board on the selector lever.

The selector lever positions:

- Selector lever in the Tiptronic gate
- Tip +
- Tip -

are recognized by the camshaft position sensors (2005 Jetta).

The signals are sent over an analog wire to the Transmission Control Module (TCM) J217.

Signal Utilization

Based on the signal from the Tiptronic switch, the Transmission Control Module (TCM) J217 shifts a gear “up” or “down”, depending on operation.

Effects of Signal Failure

If the switch fails or if a wire is faulty, Tiptronic mode is no longer available.

Tiptronic Upshift Button (on Steering Wheel) E438 and Tiptronic Downshift Button (on Steering Wheel) E439

These optional buttons are found on the steering wheel on the right and left. Upshifting and downshifting occurs by operating the buttons.

The shift signals go directly to the Transmission Control Module (TCM) J217.

Signal Utilization

In Tiptronic mode, shifting can also occur using these buttons.

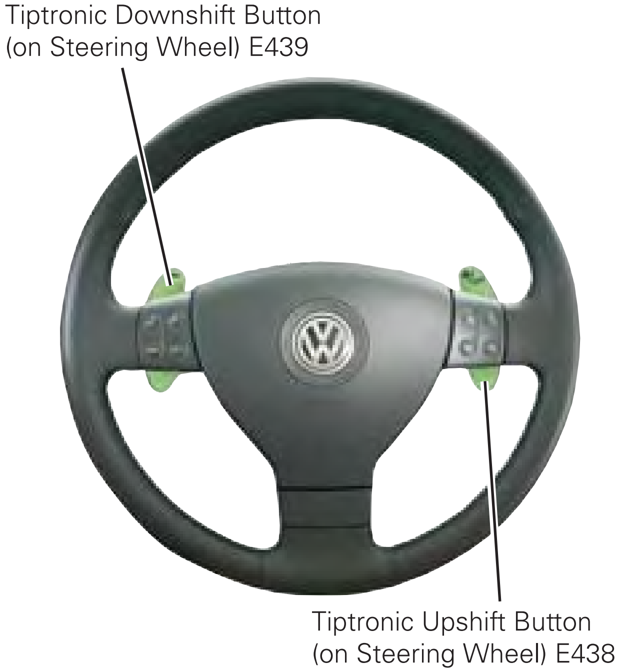
If the Tiptronic buttons on the steering wheel are operated in automatic mode, the transmission control enters Tiptronic mode. If the Tiptronic buttons are then not operated, the transmission control returns to automatic mode after the expiration of a clock timer.

Effect of Signal Failure

In case of a signal failure, no Tiptronic functions are possible using the steering wheel buttons.

Tiptronic Shifting Strategy

- Automatic upshifting when the maximum RPM is reached.
- Automatic downshifting when the RPMs fall below the minimum RPM.
- Kick down downshifting.
- Acceleration from standstill in second gear by selecting 2nd gear before accelerating.
- Upshift prevention or downshift prevention.


Tiptronic Downshift Button (on Steering Wheel) E439
Tiptronic Upshift Button (on Steering Wheel) E438

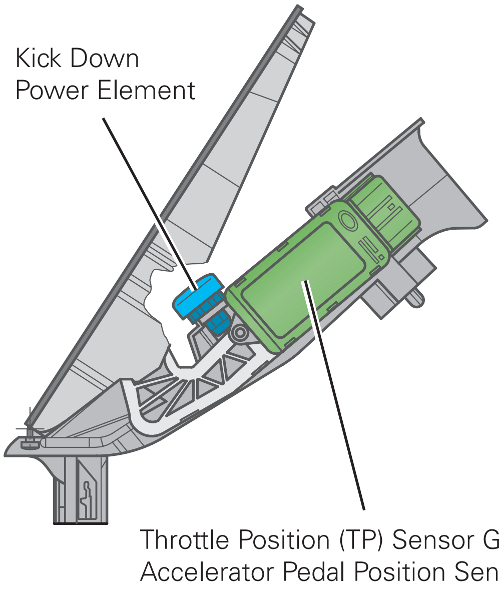
Throttle Position (TP) Sensor G79 and Accelerator Pedal Position Sensor 2 G185

The sensors are located in an accelerator pedal module on the pedal cluster.

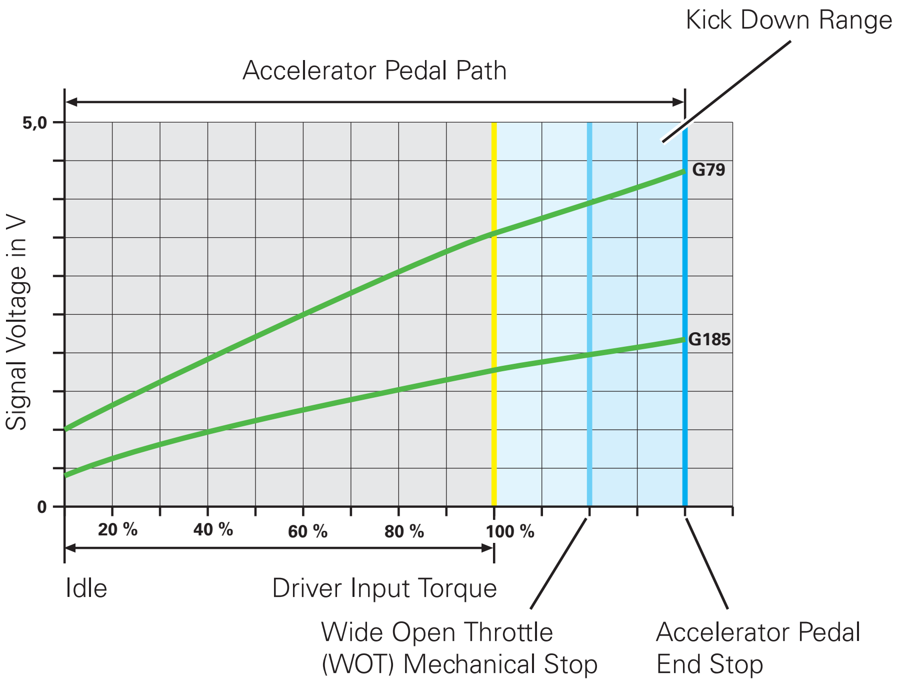
Kick Down Information

A separate switch is not used for kick down information. There is a power element on the accelerator pedal in place of a compression buffer (for manual transmissions). The power element generates a “mechanical pressure point” that provides the “kick down feeling” to the driver. If the driver activates kick down, the Wide Open Throttle (WOT) voltage value of Throttle Position (TP) Sensor G79 and Accelerator Pedal Position Sensor 2 G185 is exceeded.

If a voltage value defined in the Motronic Engine Control Module (ECM) J220 is reached in doing so, this is interpreted as kick down by the ECM and is transmitted via the powertrain CAN to the Transmission Control Module (TCM) J217. The kick down shifting point can only be tested using the diagnostic tester.


Kick Down
Power Element
Throttle Position (TP) Sensor G79 /
Accelerator Pedal Position Sensor 2 G185

For safety reasons, two throttle position sensors are used.



Actuators

In the electronically controlled automatic transmission, solenoid valves are used as electrohydraulic shifting elements. There is a difference between solenoid valves (on/off valves) and electrical pressure control valves (designated as modulation valves or also as metering solenoid valves).

Solenoid Valves

Solenoid Valve 1 N88

Solenoid Valve 1 N88 works as an on/off solenoid valve and opens or closes an ATF channel. Solenoid Valve 1 N88 is on and open in gears 4 through 6. Additionally, shifting from 5th to 6th gear is improved via the solenoid valve. Without current, the solenoid valve is closed.

Effect of Signal or Actuator Failure

It is no longer possible to shift into gears 4 through 6.

Solenoid Valve 2 N89

Solenoid Valve 2 N89 works as an on/off solenoid valve and opens or closes an ATF channel. When Solenoid Valve 2 N89 is on and open, ATF pressure on the torque converter lock-up clutch is increased.

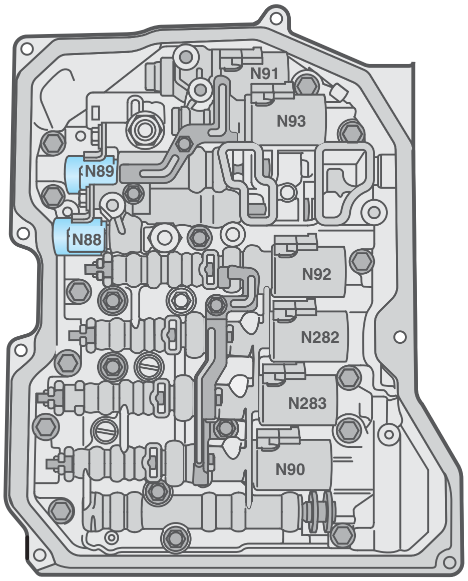
If Solenoid Valve 1 N88 and Solenoid Valve 2 N89 are simultaneously opened, brake B2 closes and in 1st gear in Tiptronic mode, “engine braking” is active.

The valve is closed with no current present.

Effect of Signal Failure

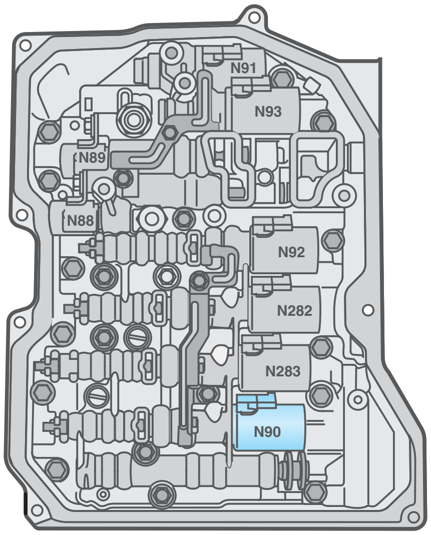
If the signal to Solenoid Valve 1 N89 fails, the torque converter lock-up clutch can no longer be pressurized to the maximum ATF pressure and “engine braking” is not possible.

Valve Body



Electrical Pressure Control Valves

Solenoid Valve 3 N90



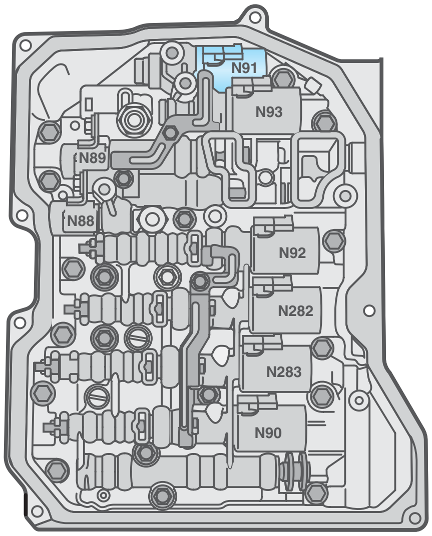
Solenoid Valve 3 N90 regulates ATF pressure to multi-disc clutch K1.

The solenoid valve is closed with no current present. In this shifting condition, the maximum ATF pressure affects the clutch.

Effect of Signal Failure

If the solenoid valve is faulty or it cannot be activated, shifting gears 1 through 4 can be harder.

Solenoid Valve 4 N91



Solenoid Valve 4 N91 regulates ATF pressure to the torque converter lock-up clutch.

If Solenoid Valve 4 N91 is without current, the torque converter lock-up clutch is opened.

Effect of Signal Failure

The torque converter lock-up clutch remains open.

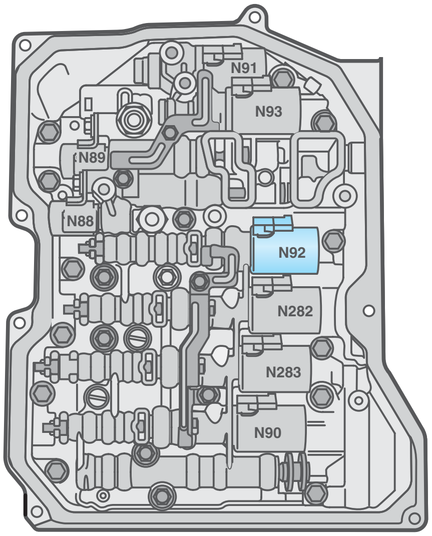
Solenoid Valve 5 N92

Solenoid Valve 5 N92 regulates ATF pressure to multi-disc clutch K3.

The solenoid valve is closed with no current present. In this shifting condition, maximum ATF pressure acts on the clutch.

Effect of Signal Failure

If the solenoid valve is faulty or it cannot be activated, the shifting of gears 3, 5, and R can be harder.



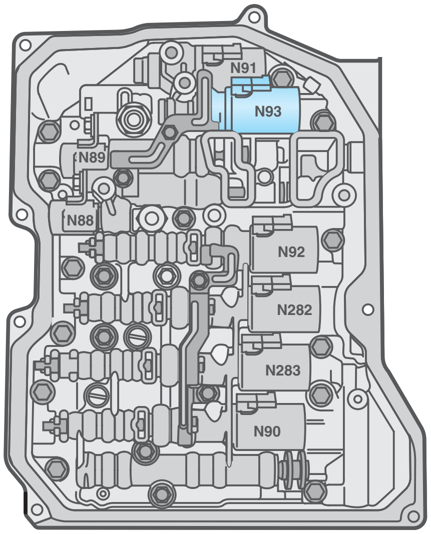
Solenoid Valve 6 N93

Solenoid Valve 6 N93 regulates main ATF pressure in the transmission depending on engine torque.

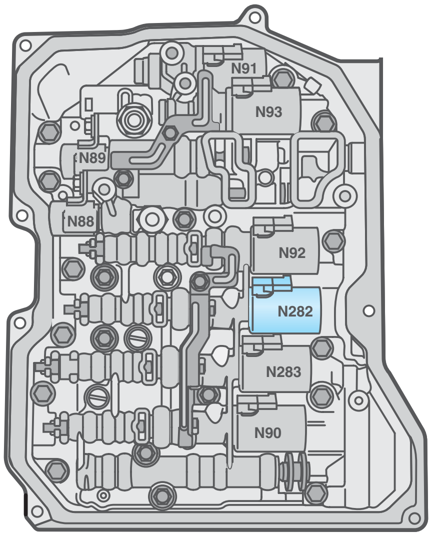
Without current, the solenoid valve is closed and the transmission operates with maximum ATF pressure.

Effect of Signal Failure

With a faulty solenoid valve or a malfunction in the electrical circuit, all shifting may be harder.



Solenoid Valve 9 N282



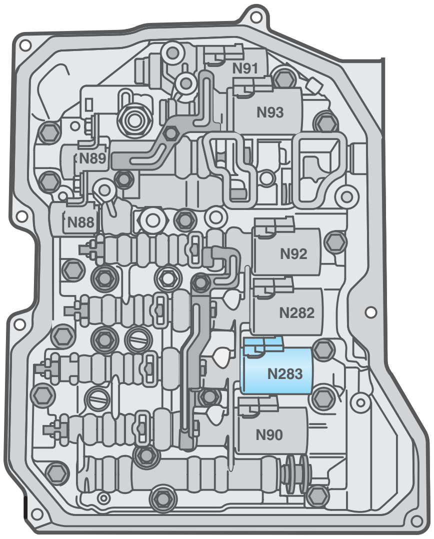
Solenoid Valve 9 N282 regulates ATF pressure to multi-disc clutch K2.

The solenoid valve is closed with no current present. In this shifting condition, maximum ATF pressure acts on the clutch.

Effect of Signal Failure

With a faulty solenoid valve or a malfunction in the electrical circuit, all shifting of gears 4 through 6 may be harder.

Solenoid Valve 10 N283



Solenoid Valve 10 N283 regulates ATF pressure to multi-disc brake B1.

The solenoid valve may close depending on the current value. Without current, the brake is closed and ATF pressure is maximum.

Effect of Signal Failure

With a faulty solenoid valve or a malfunction in the electrical circuit, the shifting of gears 2 and 6 may be harder.

Shift Lock Solenoid N110

The solenoid is located in the selector lever support.

It is an electromagnet and prevents the operation of the selector lever out of the "P" and "N" positions with the ignition switched on. To operate the selector lever out of these positions, the foot brake must be depressed.

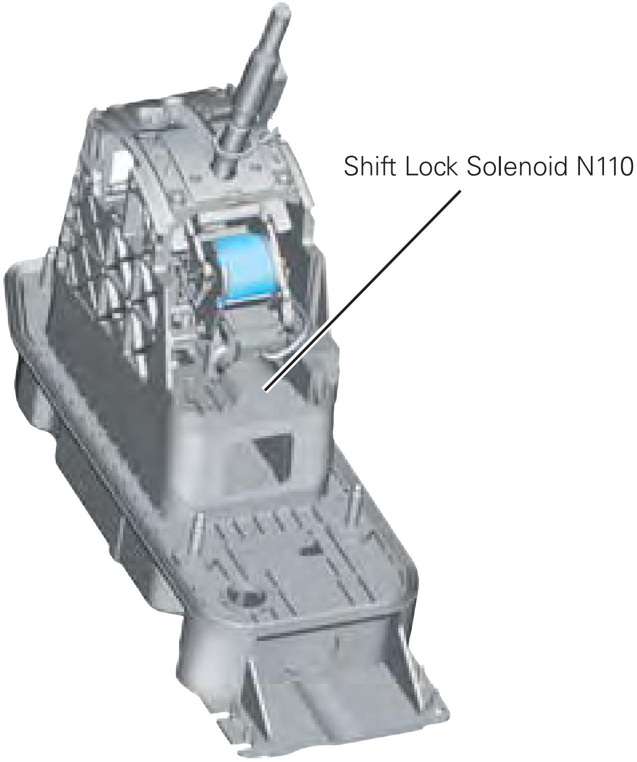
Jetta

The selector lever is locked in the "P" position with an unpowered solenoid and in the "N" position with a powered solenoid.

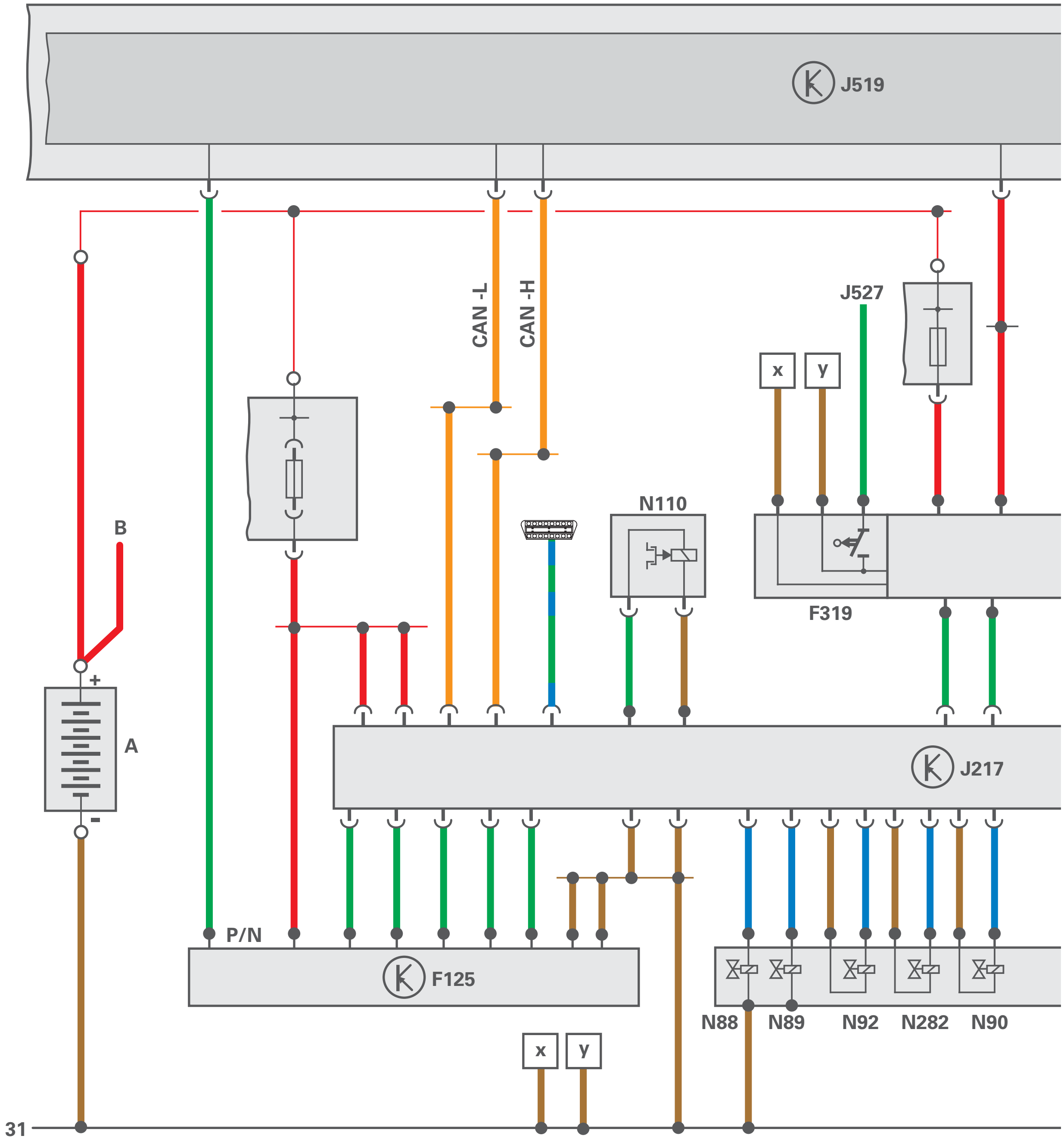
Effects of Signal Failure

In case of a power outage, the selector lever is locked. To operate it, the emergency release must be used.

Selector Lever Support



2005 Jetta Functional Diagram


J519
CAN -L
CAN -H
J527
x
y
N110
B
F319
+
A
-
J217
P/N
F125
N88
N89
N92
N282
N90
x
y
31

Color Coding/Legend

🟩 = Input

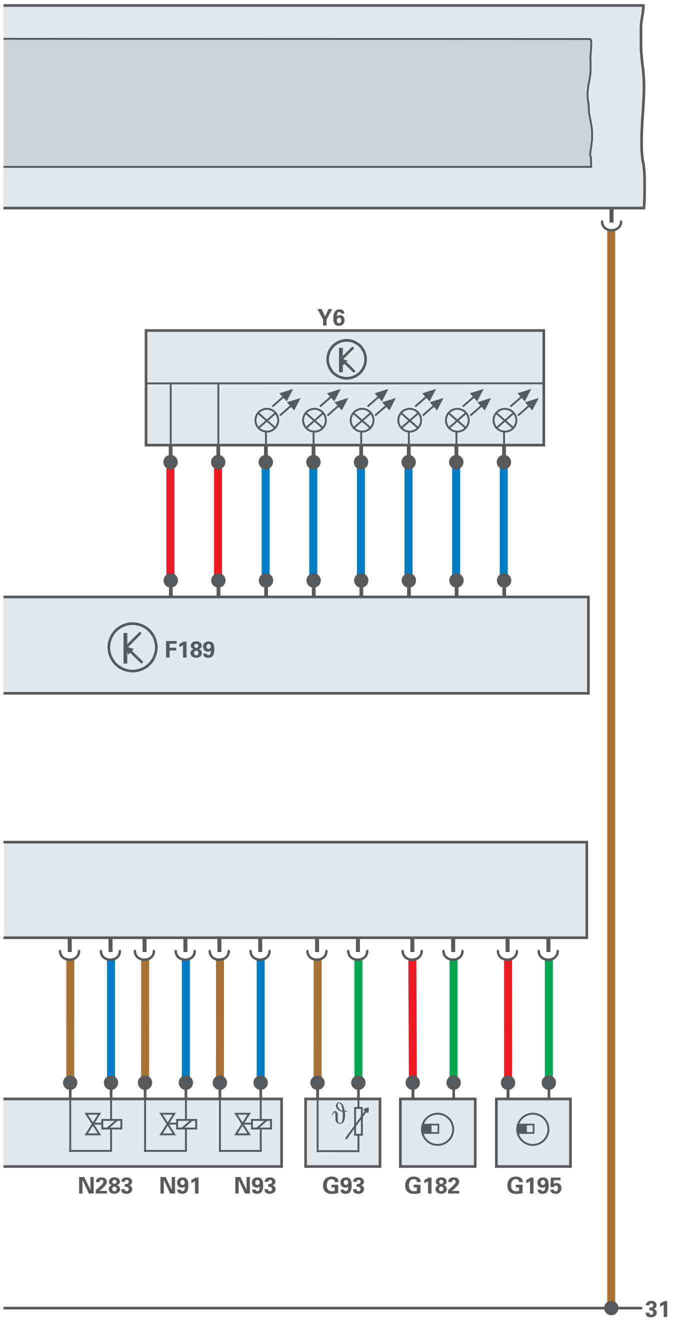
🟦 = Bi-directional

🟩🟦 = Output Signal

🟥 = B+

🟫 = Ground (GND)

🟧 = CAN Databus



Components

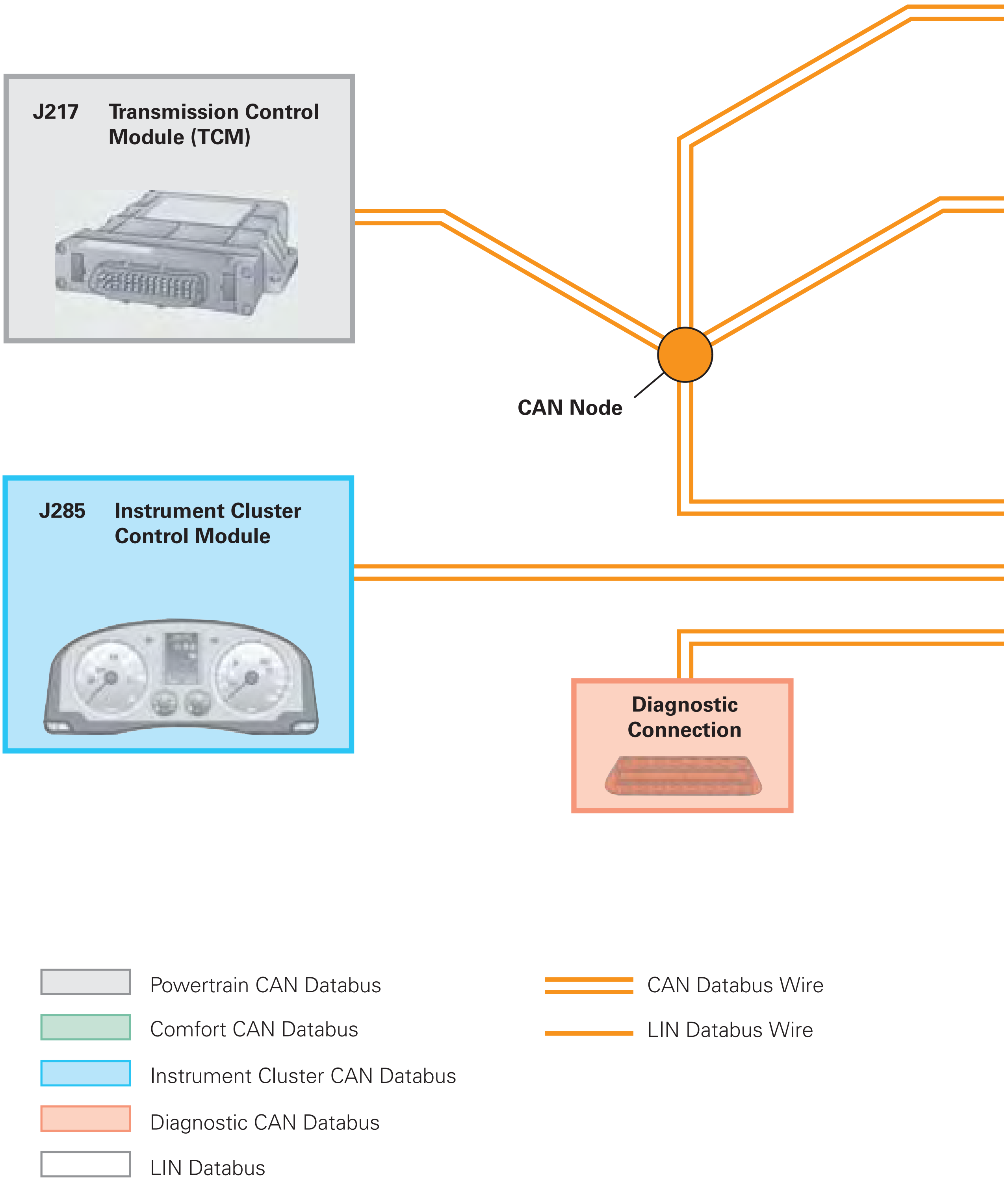
A	Battery
B	Starter
F125	Multi-Function Transmission Range (TR) Switch
F189	Tiptronic Switch
F319	Selector Lever Park Position Lock Switch
G93	Transmission Fluid Temperature Sensor
G182	Transmission Input Speed (RPM) Sensor
G195	Transmission Output Speed (RPM) Sensor
J217	Transmission Control Module (TCM)
J519	Vehicle Electrical System Control Module
J527	Steering Column Electronic Systems Control Module
N88	Solenoid Valve 1
N89	Solenoid Valve 2
N90	Solenoid Valve 3
N91	Solenoid Valve 4
N92	Solenoid Valve 5
N93	Solenoid Valve 6
N110	Shift Lock Solenoid
N282	Solenoid Valve 9
N283	Solenoid Valve 10
Y6	Transmission Range (TR) Display

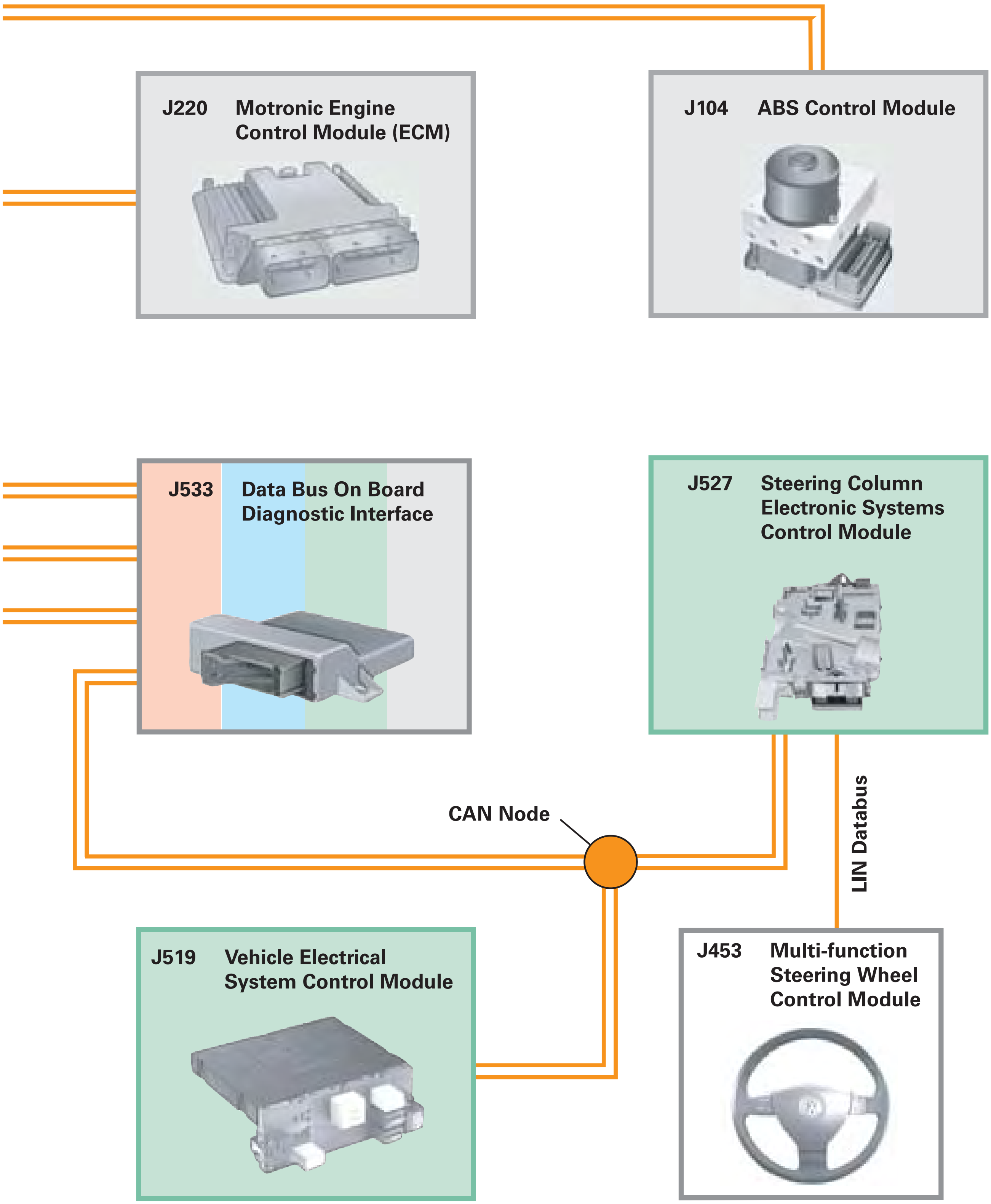
Diagnostic Connection

Additional Signals

CAN-H	CAN Databus High
CAN-L	CAN Databus Low

2005 Jetta CAN Databus Connections


J217 Transmission Control Module (TCM)
CAN Node
J285 Instrument Cluster Control Module
Diagnostic Connection
Powertrain CAN Databus
Comfort CAN Databus
Instrument Cluster CAN Databus
Diagnostic CAN Databus
LIN Databus
CAN Databus Wire
LIN Databus Wire


J220 Motronic Engine Control Module (ECM)
J104 ABS Control Module
J533 Data Bus On Board Diagnostic Interface
J527 Steering Column Electronic Systems Control Module
CAN Node
LIN Databus
J519 Vehicle Electrical System Control Module
J453 Multi-function Steering Wheel Control Module

Diagnostic

The VAS 5051 Vehicle Diagnosis, Test and Information System and the VAS 5052 Vehicle Diagnosis, Test and Information System are available for diagnostics.

The VAS 5051 Vehicle Diagnosis, Test and Information System has the operating modes:

- Guided Fault Finding
- Guided Functions
- Vehicle Self-diagnostic
- OBD (On-Board Diagnostic)
- Measurement

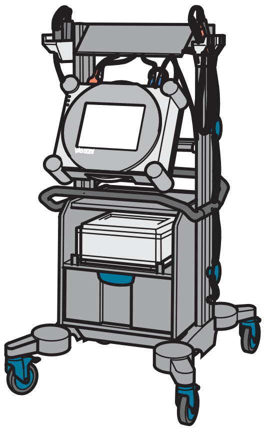
The **"Guided Fault Finding"** operating mode performs a vehicle-specific check of all installed control modules for malfunction entries and automatically compiles a system test plan from the results.

Together with the service information such as wiring diagrams or repair manuals, this leads systematically to the malfunction cause.

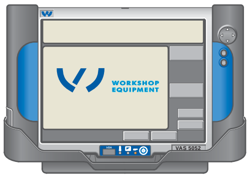
Independently of this, it is possible to assemble a custom test plan. Via the function and component selection, the selected tests are incorporated into the test plan and can be executed in desired sequence for additional diagnostic procedures.

Detailed information regarding the procedures and the functionality of the Guided Fault Finding can be found in in chapter 7 of the VAS 5051 operating manual.

VAS 5051



VAS 5052



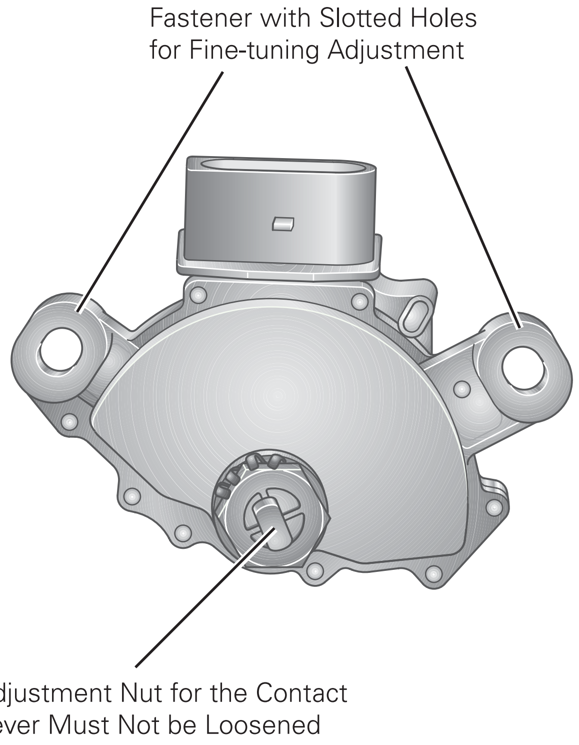
The **"Vehicle Self-diagnostic"** operating mode can still be used, but no service information is available.

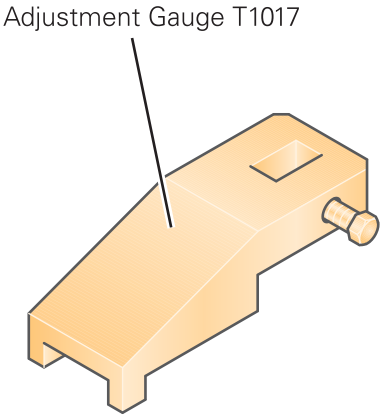
The "Guided Functions" operating mode can easily be used for everyday service functions such as the adaptation of vehicle keys.

VAS 5052 also offers "Guided Fault Finding" and "Guided Functions" operating modes.

Special Tools

Adjustment of Multi-Function Transmission Range (TR) Switch F125


Fastener with Slotted Holes for Fine-tuning Adjustment
Adjustment Nut for the Contact Lever Must Not be Loosened


Adjustment Gauge T1017

Glossary

Terms

Spread

In the context of transmissions as the subject under discussion, spread is defined as the “gear ratio range” of a transmission. The spread is ratio between the gear ratio in 1st gear and in 6th gear (highest gear). The value of the spread is obtained by dividing the ratio of the 1st gear by that of the highest gear (here, 6th gear).

Using the 09G transmission as an example:

1st gear 4.148

6th gear 0.686 4.148 : 0.686 = 6.05 (value rounded up)

Advantages of a large spread are:

In addition to a high acceleration ratio (for high traction), a low end ratio can be achieved. This last provides for an RPM reduction, which in turn decreases the noise level and enables a low fuel consumption.

A large spread requires a corresponding number of gears so that the RPM differences when shifting gears (gear transitions) are not too great. When shifting, the engine should not enter into low torque RPM ranges that would make acceleration difficult or impossible.

Tiptronic Shifting Strategy

Acceleration from standstill occurs normally in 1st gear.

It is possible to accelerate from standstill in second gear by upshifting into second gear before accelerating (using steering wheel Tiptronic or selector lever). This facilitates acceleration from standstill when road traction is low, e.g., for winter street conditions.

In addition to allowing the manual shifting of gears, the Tiptronic function is necessary, for example, to make use of engine braking. By dispensing with positions 4, 3, 2 (new selector lever shift gate with positions “D” and “S”), a desired upshift prevention must be selected using the Tiptronic function (shift selector lever into the Tiptronic gate).

Knowledge Assessment

An on-line Knowledge Assessment (exam) is available for this Self-Study Program.

The Knowledge Assessment may or may not be required for Certification.

You can find this Knowledge Assessment at:

www.vwwebsource.com

From the vwwebsource.com Homepage, do the following:

- Click on the Certification tab
- Type the course number in the Search box
- Click "Go!" and wait until the screen refreshes
- Click "Start" to begin the Assessment

For assistance, please call:

Certification Program Headquarters

1 - 877 - CU4 - CERT

(1 - 877 - 284 - 2378)

(8:00 a.m. to 8:00 p.m. EST)

Or, E-mail:

Comments@VWCertification.com

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Auburn Hills, MI 48326
Printed in U.S.A.
April 2005

Cautions & Warnings

Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Volkswagen retailer or other qualified shop. We especially urge you to consult an authorized Volkswagen retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Volkswagen.

- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.

- Volkswagen is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Volkswagen retailer parts department for the latest information.

- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the VAG 1551 Scan Tool (ST).

- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.

- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.

- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it.

- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.

- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.

- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.

- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.

- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.

next

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Version 1.0

Cautions & Warnings

- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.

- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.

- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly; do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Volkswagen specifications. Makeshift tools, parts and procedures will not make good repairs.

- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.

- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.

- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.

- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.

- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.

- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.

- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.

- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).

- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Volkswagen Service technicians should test, disassemble or service the airbag system.

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Version 1.0

Cautions & Warnings

- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.

- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Volkswagen Service technicians using the VAG 1551 Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.

- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.

- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

I have read and I understand these Cautions and Warnings.

back **OK**

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